DOCUMENT RESUME

ED 235 333 CE 037 117

AUTHOR Coelen, Craig G.; Gaumer, Gary
TITLE Effects of Federal Support for Nursing Education on Admissions, Graduations, and Retention Rates at Schools of Nursing.
INSTITUTION Abt Associates, Inc., Cambridge, Mass.
SPONS AGENCY Health Resources Administration (DHHS/PHS), Hyattsville, Md.
REPORT NO AAI-82-5
PUB DATE 7 Jun 82
CONTRACT HRA-232-80-0015
NOTE 136p.
PUB TYPE Reports - Evaluative/Feasibility (142)

EDRS PRICE MF01/PC06 Plus Postage.
DESCRIPTORS Educational Finance; Employment Patterns; Federal Programs; Financial Support; Futures (of Society); Labor Needs; *Labor Supply; Nurses; *Nursing Education; Postsecondary Education; *Program Effectiveness; Student Financial Aid; *Student Loan Programs
IDENTIFIERS *Nurse Training Act 1964

ABSTRACT

This study examined the impact of federal assistance on the number of students entering, continuing in, and graduating from basic nurses training programs. The effects of the Nurse Training Act (NTA) of 1964 were examined through measuring the differences (in admissions, attritions, and graduations) between school years in which NTA funding was received and school years in which funding was not received. Statistical techniques were used to control for differences across schools and years in the size of the available pool of high school graduates and other external factors that might affect admissions, attritions, and graduations. NTA funding was found to have had a significant impact. At least 47,000 additional students entered basic nurses training programs between 1969 and 1979 as a result of federal assistance, and 70 percent or more of these additional students were expected to join the professional nursing work force. (KC)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED235333

ABT ASSOCIATES INC.
55 WHEELER STREET, CAMBRIDGE, MASSACHUSETTS 02138
TELEPHONE • AREA 617-492-7100
TWX: 710-3201382

AAI #82-5

EFFECTS OF FEDERAL SUPPORT FOR NURSING EDUCATION ON ADMISSIONS, GRADUATIONS, AND RETENTION RATES AT SCHOOLS OF NURSING

June 7, 1982

Craig G. Coelen
Gary Gaumer

HRA Contract No. 232-80-0015

Prepared for

Health Resources Administration
Center Building, Room 10-22
3700 East-West Highway
Hyattsville, MD 20782

EE 037117

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☑ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

AN EQUAL OPPORTUNITY EMPLOYER

EXECUTIVE SUMMARY

Effects of Federal Support for Nursing Education on Admissions, Graduations, and Retention Rates at Schools of Nursing

The Nurse Training Act of 1964 authorized a substantial five-year program of federal support for nursing schools and nursing students. With some changes in size and specific features, the program was extended by the Health Manpower Act of 1968 and by the Nurse Training Acts of 1971 and 1975. Between the fiscal years of 1965 and 1979, more than one billion dollars was provided in support of nursing education, in the form of grants to training institutions and loans and scholarships to students.

The legislation of 1964 and subsequent years sought to achieve a number of objectives:

- increase the size of the nursing workforce;
- improve the geographic distribution of nurses;
- increase the number of nurses with advanced training;
- improve access to nursing careers for minorities;
- improve the quality of nursing education; and
- upgrade skills and expand roles through continuing education.

Ideally, federal support for nursing education should be evaluated relative to all of these objectives.

The study summarized here examines federal assistance to nursing education from one perspective--impact on the number of students entering, continuing in, and graduating from basic nurse-training programs. Due to limitations of available data, the study is unable to examine the effects of federal assistance on advanced training, on educational quality, on access

for minorities, and on other aspects of intended impact. Despite the important limitations, the study indicates that federal funds have had important effects:

- 47,000 additional admissions at basic programs between 1969 and 1979;
- among those entering nursing school as a result of federal support, a retention rate that is likely to be higher than average; and
- 32,800 to 42,200 additional graduations from basic programs between 1969 and 1979.

Because of the areas of impact the study is not able to examine and for other reasons indicated below, these estimates provide only a partial accounting of the benefits resulting from federal aid to nursing schools and nursing students.

Background of the Study

In 1963, the Surgeon General's Consultant Group on Nursing prepared a comprehensive and influential report on the availability of nurses and the problems facing nursing education. The report provided a variety of evidence to document the existence of an acute shortage of nurses. It pointed out that nurses' wages were low, that the nursing workforce was inadequately distributed across and within states, and that nursing schools were inadequately equipped to deal with existing and future problems. The Consultant Group recommended a substantial program of federal assistance to increase the flow of new nursing graduates into the workforce and to improve the quality of nursing education.

Subsequent legislation authorized a variety of different types of federal assistance for nursing schools and nursing students. In terms of

funds awarded between 1965 and 1979, the most important categories of federal support are the following:*

- Construction Assistance--awards for construction of new facilities and renovation of existing facilities ($170 million);
- Capitation Grants--referred to as formula grants in early years, awards to institutions for general use; amounts generally based on number of students ($283 million);
- Special Project Grants--awards to achieve diverse objectives, including help to financially distressed institutions, start-up of new programs, training for nurse practitioners, and other purposes ($242 million); and
- Loan and Scholarship Funds--funds to students to cover educational costs ($397 million).

Funding generally increased each year from 1965 to the mid-1970s, but by 1979 the level of federal support had been reduced significantly.

The mid-1970s marked the beginning of a disagreement within the federal government about the need for continued federal assistance to nursing education. In the early 1960s, there was widespread agreement that the supply of nurses was inadequate and that federal aid for nursing education would help to alleviate the shortage. By the mid-1970s, however, the basis for consensus was not as strong.

- The number of active nurses had risen substantially (81 percent increase from 1962 to 1975) as new nursing school graduates entered the profession and as labor force participation rates among existing nurses rose.
- Enrollment in nursing programs almost doubled (1964 to 1975) as two-year associate degree programs of junior colleges and four-year baccalaureate programs expanded rapidly and far more than offset the decline of the previously predominant three-year diploma programs run by hospitals.

*See Table 2 in the companion report for sources of data and for specific details on classification of funds by type of assistance.

- Empirical studies of federal support for nursing education had found no satisfactory statistical evidence of effects or had found evidence that any effects of federal aid would occur slowly and not be large enough to have an appreciable impact on a sizeable nursing shortage.

Although many experts continued to believe in the importance of federal support for nursing education, the lack of strong consensus was reflected in Presidential vetoes of Nurse Training Act (NTA) legislation and the use of continuing resolutions to extend authority for federal assistance.

Analytic Methodology of the Study

Most of the previous empirical studies of the effects of NTA funding have examined trends in nursing school admissions and graduations at the national level. In contrast, this study uses year-by-year data on admissions, attritions, and graduations at individual nursing schools. The availability of data for individual school years makes it possible to draw contrasts across schools in any given year and across years for any given school. Since schools received NTA funds in some years but not in others, and since the types of aid received (e.g., construction assistance versus capitation grants) changed from year to year, contrasts across schools and years can be used to isolate the effects of receipt of each major type of NTA funding.

The major features of the analytic methodology used in the present study are the following.

- The effects of NTA funding are measured as differences (in admissions, attritions, or graduations) between school-years in which NTA funding was received and school-years in which funding was not received.

- Statistical techniques are used to control for differences across schools and years in the size of the available pool of high school graduates and other external factors which might affect admissions, attritions, and graduations.

- Statistical techniques are adapted to test for potential differences in the effects of different types of aid and to allow for potential differences in impact across the three types of educational programs (diploma, associate, and baccalaureate).

- Since each piece of authorizing legislation made changes in the NTA programs of assistance, statistical methods are adapted to allow for potential differences in the effect of each type of aid from one legislative cycle to the next.

- Large schools will have large admissions, attritions, and graduations and are also likely to receive large awards of NTA funds. To avoid the possibility that statistical tests will do nothing more than uncover this tautalogical relation between size and level of funding, each analysis is conducted separately for small, medium, and large programs. Furthermore, federal aid is measured not by how much aid was received but by whether or not any aid was received. Statistical results should therefore provide a conservative but valid test of the proposition that receipt of federal aid leads to increases in admissions and graduations.

Available data permit analysis of effects for associate programs for the period from 1968 to 1979; for diploma and baccalaureate programs analyses begin with 1969.

Statistical Results

Of the large number of statistical results of the study, the most consistent and persuasive findings pertain to the effects of NTA funds on nursing school admissions. Although the statistical models used in the study are not very successful in separating the effects of formula/capitation grants from the effects of loan/scholarship funds, valid estimates of the combined effects of both types of aid are available. In virtually all cases, the estimates of combined effects indicate that larger entering classes are associated with receipt of the two types of NTA funds. Furthermore, the pattern is consistent enough across schools and years to pass standard tests of statistical validity in a high percentage of cases.* Larger entering

*Estimates of the combined effects of formula/capitation grants and loan/scholarship funds are positive and statistically significant (95 percent confidence level) in 14 of 21 cases.

classes are also associated with receipt of funds for construction, but these funds were received too infrequently for statistical methods to provide powerful tests of the existence of a consistent effect.

The statistical models predict that between 1969 and 1979 formula/capitation grants, loan/scholarship funds, and construction awards produced an increase of about 47,000 nursing school admissions.

Type of Program	Predicted Increase in Admissions, 1969-1979	Admissions at Schools with Funding, 1969-1979
Diploma	16,521	195,260
Associate	14,173	285,089
Baccalaureate	16,208	220,489
Total	46,902	700,838

The total effect was divided fairly evenly across the three types of basic educational programs; more than 60 percent of the estimated impact occurred in the last four years of the 11 year period.

There appears to be no consistent relationship between receipt of NTA funds and nursing school attritions. Of the numerous estimates obtained—for different types of funding, for different legislative periods, and for different types and sizes of schools—the implied effects of NTA funds on attritions are more often positive than negative. Most of the implied effects, however, are small in magnitude and not statistically significant. Overall, the results are consistent with the proposition that small increases in nursing school attritions are associated with receipt of NTA funds. Since federal assistance is associated with an increase in admissions, one would expect that some increase in attritions would also occur. The fact that estimated increases in attritions are small is an

important result, for it implies that retention rates among those who enter nursing school as a result of federal aid are likely to be no higher, and may in fact be lower, than retention rates among other students.

The performance of the statistical models used to analyze graduations is somewhat disappointing. Although the majority of the results imply that graduations increase as the result of NTA funding, the size of the estimated effects are modest. Patterns are not consistent enough across schools and years to pass standard tests of statistical validity in the majority of cases. The increase in graduations predicted to result from formula/capitation grants, loan/scholarship funds, and construction awards between 1969 and 1979 is only about half as large as the 47,000 increase in admissions predicted for the same period.

Alternative estimates of the impact of NTA funding on nursing school graduations are obtained by utilizing results of the analyses of admissions and attritions. If the attrition rate for the 47,000 additional nursing school entrants estimated to result from federal aid is equal to the attrition rate for other students (30 percent), then the increase in graduations should be 32,800. If attrition rates are very low among the additional entrants (10 percent, for example) then the increase in graduations may be as high as 42,200. These alternative estimates of the increase in graduations are accepted here as more reliable than the lower estimates obtained directly from our graduation models.*

*In simplified form, the argument in favor of the alternative estimates is the following: (1) the directly predicted increases in admissions and graduations are inconsistent unless the attrition rate for additional entrants is very high (40-50 percent); (2) the relationship between graduations and federal aid is more difficult to model than the relationship between admissions and federal aid; and (3) predictions based on the admissions models are therefore preferred.

There are a number of important reasons to believe that even the higher estimates of the increase in graduations understate the actual effects of NTA funding.

- A significant portion of the change in nursing school enrollments from 1969 to 1979 resulted from the opening of new associate and baccalaureate programs and the closing of diploma programs. Estimates presented here do not reflect the degree to which NTA funding stimulated the creation of new programs and slowed the decline of existing programs.

- Estimates presented here reflect the effects of NTA funding over and above the effects of much larger general programs of state and federal support for postsecondary education. To the extent these other programs are cut back in future years, the potential leverage of NTA funding should increase significantly.

- The estimates presented reflect the effects of NTA funding on only one aspect of the educational system--size of basic enrollment. To the extent that federal support has improved educational quality, promoted access, improved allocation and utilization of nursing services, and achieved other objectives, estimates of impact on basic enrollment significantly understate the full effect of NTA funding.

- The effects of special project grants, aid to graduate programs, and other types of funding have not been analyzed.

During the course of the research, some ancillary analyses were performed to address certain subsidiary questions. Among the findings of these analyses are the following.

- There are no major differences in the relative efficacy of NTA funding across the three types of basic educacional programs.

- Our statistical models are not powerful enough to provide definitive measures of the relative efficacy of alternative types of funding.

- There is no evidence to indicate that federal aid is more effective in states with low ratios of nurses to population than in states with high ratios. No extra increase in nursing students is achieved, therefore, by channeling federal funds to specific states.

- There are some systematic differences in the frequency of receipt of NTA funds across programs. Large schools within each of the three categories of programs receive NTA funds with higher frequency than do small programs. For any given size of program, frequency of receipt of NTA funds is highest for baccalaureate programs and lowest for diploma programs.

Our analysis points to no specific barriers to schools' participating in NTA programs. Since the programs have been shown to be quite effective in stimulating nursing school enrollment, however, it is particularly important to be sure that no unintended barriers to participation actually exist.

Summary

The funds provided to nursing schools and nursing students under NTA programs have had a significant impact. At least 47,000 additional students entered basic nursing training programs between 1969 and 1979 as a result of federal assistance, and 70 percent or more of these additional students are now, or soon will be, professional nurses. Because a number of the potential effects of federal support for nursing education were not examined in this study, it is likely that the estimates presented here understate the benefits that have resulted from NTA programs. Nevertheless, the effects we have estimated are important. It is unrealistic to expect federal support for nursing education to produce massive changes in the size of the nursing workforce in a short period of time, but over the period of a decade the impact of assistance provided under NTA legislation had a very appreciable effect.

TABLE OF CONTENTS

Section		Page
	EXECUTIVE SUMMARY	ii
1.0	BACKGROUND OF THE EVALUATION	3
	1.1 Chronology of Federal Support for Nusing Education	3
	1.2 Trends in the Market for Nursing Services	6
	1.3 Changes in Nursing Education	8
	1.4 Previous Studies of the Impact of Federal Support for Nursing Education	10
	1.5 Studies Not Specific to Nursing Education	15
	1.6 Implications for Research	19
2.0	ANALYTIC METHODOLOGY, STATISTICAL TECHNIQUES, AND DATA	22
	2.1 Research Questions for Empirical Analysis	22
	2.2 General Research Strategy	27
	2.3 Special Estimation Issues	34
	2.4 Variable Definitions and Data	42
3.0	STATISTICAL RESULTS AND THEIR IMPLICATIONS	53
	3.1 General Summary of Statistical Results	53
	3.2 Estimated Effects of NTA Funding	60
	3.3 Implications of Statistical Results	84
	FOOTNOTES	92
	APPENDIX A: MISCELLANEOUS STATISTICAL TABLES	

LIST OF TABLES

Table		Page
1	Enrollment and Number of Nurse-Training Programs	10
2	Federal Funds Awarded to Schools of Nursing By Types of Award By Year, 1965 to 1979	11
3	Number of Programs and Program-Years in Data Set Used for Analysis	52
4	Regression Results: Number of Nursing School Admissions, By Type and Size of Program	54
5	Regression Results: Number of Nursing School Attritions, By Type and Size of Program	55
6	Regression Results: Number of Nursing School Graduations, By Type and Size of Program	56
7	Distribution on Nursing Programs by Receipt/Nonreceipt of Formula/Capitation Grants and Loan/Scholarship Funds by Size and Type of Program by Year	65
8	Estimated Effects of NTA Funding Per Program Per Year By Size and Type of Program	68
9	Estimated Increase in Nursing School Admissions Due to Capitation Grants, NTA Loans/Scholarships, and Construction Grants	79
10	Changes in Enrollment Due to Closure, Startup of New Programs and Year-to-Year Variations at Continuing Programs	82
A-1	Means ($\bar{X}$) and Standard Deviations (s) for Variables Used in Regression Models for Diploma Programs	A-1
A-2	Means ($\bar{X}$) and Standard Deviations (s) for Variables Used in Regression Models for Associate Programs	A-3
A-3	Means ($\bar{X}$) and Standard Deviations (s) for Variables Used in Regression Models for Baccalaureate Programs	A-5
A-4	Frequency of Year-to-Year Decreases in Admissions by Type of Program by Receipt/Nonreceipt of Formula/Capitation Grants by Year	A-7
A-5	Regression Results: Number of Nursing School Admissions, By Type and Size of Program	A-8
A-6	Percentage of Schools Receiving NTA Funding By State, 1968/69 to 1979	A-9
A-7	Regressions Results: Receipt/Nonreceipt of Loan/ Scholarship Funds and Receipt/Nonreceipt of Formula/ Capitation Grants By Type of Program	A-10

The Nurse Training Act of 1964 authorized a substantial five-year program of federal support for nursing schools and nursing students. With some changes in size and specific features, the program was extended by the Health Manpower Act of 1968 and by the Nurse Training Acts of 1971 and 1975. Between the fiscal years of 1965 and 1979, the program provided more than one billion dollars in support of nursing education, in the form of grants to training institutions and loans and scholarships to students.

This report presents the results of a study of the effects of federal support for nursing education on admissions, graduations and retention rates at basic nurse-training programs. Three categories of federal aid are studied in detail: (1) formula grants and capitation grants provided to institutions; (2) construction assistance provided to institutions; and (3) loans and scholarships provided to students. The time period covered by the evaluation is the late 1960s and the 1970s--the maximum interval for which data were available for empirical analysis. A particularly important focus of the study is potential differences in effects of federal aid for the three generic types of basic nurse training programs--diploma, associate, and baccalaureate programs.

It is important to recognize at the outset that the study constitutes only a partial evaluation of federal support for nursing education. The Nurse Training Act (NTA) of 1964 and subsequent legislation sought to achieve a variety of objectives:

- increase the size of the nursing workforce;
- improve the geographic distribution of nurses;
- increase the number of nurses with advanced training;
- improve access to nursing careers for minorities;
- improve the quality of nursing education;

- upgrade the skills and expand the roles of existing nurses through continuing education.

Ideally, federal support for nursing education should be evaluated relative to each of its objectives. Due to limitations of available data, however, the study evaluates federal support for nursing education with respect to only one objective--increase in the size of the nursing workforce by means of increases in the number of graduates from basic nurse-training programs. As a consequence, the information reported here understates the impact of federal assistance on not only the size but the composition and the skills of the nursing workforce.

The report is divided into three sections. The first section provides background information on characteristics of the market for nursing services, the educational system for nurses, and the program of federal support for nursing education. This information provides a context for subsequent discussion of effectiveness of federal aid in increasing the number of nursing graduates. Section 2.0 describes the basic analytic methods, the statistical techniques, and the data which are used in the evaluation. Section 3.0 presents the results of statistical analyses and discusses their implications with regard to impact of federal assistance in the past and the likely effects of changes in federal assistance in the future. Supporting statistical tables are provided in an appendix.

1.0 Background of the Evaluation

1.1 Chronology of Federal Support for Nursing Education

In 1963, the Surgeon General's Consultant Group on Nursing prepared a comprehensive and influential report[1] on the availability of nurses and the problems facing nursing education. The report provided a variety of evidence to document the existence of an acute shortage of nurses. It pointed out that nurses' wages were low, that the nursing workforce was inadequately distributed across and within states, and that nursing schools were inadequately equipped to deal with existing and future problems. The Consultant Group recommended a substantial program of federal assistance to increase the flow of new nursing graduates into the workforce and to improve the quality of nursing education.

Based heavily upon the recommendations of the Consultant Group, the Nurse Training Act of 1964 authorized $288 million for nursing education for fiscal years 1965 through 1969. The major categories of financial assistance established by the legislation are the following:

- grants for renovation and new construction ($90 million);
- low cost and partially forgiveable loans for students ($85 million);
- continuation of graduate traineeships initiated by the Health Amendment Act of 1956 ($50 million);
- formula grants to hospital-based nursing programs (diploma schools) to defray the cost of expanding enrollments ($41 million);
- special project grants for expanding the scope and improving the quality of educational programs ($17 million);

The NTA was amended in 1966 to add $15 million for a scholarship program—Nursing Educational Opportunity Grants.

The Health Manpower Act of 1968 extended the authority for federal assistance to fiscal years 1970 and 1971. A total of $275 million was authorized for the two year period, but less than half of this amount was actually appropriated and awarded ($116 million). One of the important provisions of the 1968 legislation was the removal of the earlier restriction that to be eligible for most types of funds nursing schools had to be accredited by the National League for Nursing; after 1968 accreditation or approval by any organization or state agency designated by the Secretary of Health, Education and Welfare was sufficient for eligibility.* The 1968 legislation also increased the annual limits on the amount of money available to each student under the loan and scholarship programs and otherwise improved the availability of these forms of student assistance. One anomalous feature of the legislation is that the formula grants, previously available only to diploma programs (to offset the costs of expanding enrollment), were authorized in 1968 for all nursing schools, but no funds were actually appropriated.

The Nurse Training Act of 1971 authorized the highest level of federal support for nursing education of any legislation--$710 million for the three years from 1972 to 1974. Institutional capitation grants, the centerpiece of the new legislation, allowed schools wide latitude in the use of federal assistance. To qualify, schools were required either to expand enrollment or to offer special programs** to improve the composition or distribution of the nursing workforce. Authorized in 1968 as part of Special

---

* This was particularly helpful to state-accredited two-year associate degree (AD) programs.

**Eligible special programs included ones that: (a) trained nurse practitioners; (b) operated clinical training sites in long-term-care or ambulatory-care settings; (c) offered continuing education; or (d) recruited students from disadvantaged backgrounds.

Project Grants but funded separately by the 1971 legislation, Financial Distress Grants were designed to assist schools confronted with serious financial problems and, generally, to allow schools to increase enrollment without jeopardizing program quality or accreditation.

Authorizing $453 million for fiscal years 1976 through 1978, the Nurse Training Act of 1975 continued virtually all of the earlier categories of federal support for nursing but gave primary emphasis to highly targeted programs. Funding for advanced training and nurse practitioner programs, for example, was authorized seperately in the 1975 legislation rather than provided, as in earlier years, under the general authorization for special project grants. Authorization for construction assistance was drastically reduced from earlier levels,* and the formula used to allocate capitation funds was changed in a way that emphasized maintenance rather than expansion of enrollments.

The mid-1970s marked the beginning of a disagreement within the federal government about the need for continued federal assistance to nursing education. The Nurse Training Act of 1975 was vetoed by President Ford, but Congress succeeded in overriding the veto. The next NTA legislation, passed by Congress in 1978, was vetoed by President Carter; that veto might also have been overridden had it not occurred after Congress had adjourned. Continuing resolutions have been used since 1978 to extend the NTA programs.

---

*Very little of the funding for construction was actually awarded in 1975 and later years.

The foundation of the disagreement between Congress and the executive branch is a difference of opinion about the existence and severity of a nursing shortage.[2]

1.2 Trends in the Market for Nursing Services

To understand the uncertainty about appropriate federal policy toward nursing education in the late 1970s, it is important to be aware of changes which had taken place since the early 1960s in the market for nursing services. When the Surgeon General's Consultant Group on Nursing presented its report in 1963, its evaluation of the nursing market was widely accepted. By 1975, however, the market had changed significantly, and different authorities had very different views about the implications of the changes that had occurred.

The market for nursing services in the early 1960s can be characterized in a variety of ways.

- Workforce and Employment: About 500,000 nurses* were employed in hospitals, doctors' offices and other nursing positions; another 270,000 were not working or were employed in other fields.[3] Employment opportunities were dominated by hospitals (66% of positions).[4]

- Compensation: Salaries for hospital nurses were generally lower than salaries for secretaries, and premiums paid for experience were too small to serve as adequate incentives for nursing careers.[5] Nursing salaries relative to compensation in other largely female occupations had been declining steadily for the past 20 years.[6]

- Vacancy Rates: Unfilled jobs as a percentage of total positions for nurses had climbed steadily for 20 years and stood at 20 percent (hospital positions).[7]

---

*Unless otherwise indicated the term "nurse" is used in this report to denote a licensed registered nurse (RN) and does not refer to licensed practical nurses (LPNs) or nurses' aides.

- Distribution of Nurses: There were substantial differences across states in the ratio of nurses to population. In New England, there were approximately 450 nurses employed per 100,0000 population, whereas many southern states had fewer than 200 nurses employed per 100,000 population.[8]

Anecdotal evidence abounded of inadequacies in patient care and of closure of health facilities as a result of the limited availability of nurses. So much had been written about the size and severity of the nursing shortage that the notion of a shortage had come to be part of what one observer calls "our conventional wisdom."[9]

At the time the NTA of 1971 was being discussed in Congress, there was no reason to believe that the shortage had abated. The introduction of Medicare and Medicaid had significantly increased utilization of health care services and, thereby, had increased the need for nurses. The 1963 report of the Surgeon General's Consultant Group had forecasted a need for 850,000 employed nurses by 1970. Not only did the employment level in 1970 fall short of this projected requirement, but the advent of public health insurance programs could be used to argue that the estimate of 850,000 understated the actual need for employed nurses by 1970. Furthermore, it would have been unrealistic to expect that federal support for nursing education could have relieved much of the shortage by 1970, for those who enrolled in nursing schools as a result of federal assistance would not have graduated and entered the workforce until the late 1960s.

By the time of the 1975 and 1978 Presidential vetoes of NTA legislation, many experts had become convinced that a serious shortage of nurses no longer existed, and some believed that the shortage of early 1960s had been overestimated. Much of the basis for the change in attitudes was recent trends in the market for nursing services:

- Workforce and Employment: Between 1962 and 1975, the number of licensed nurses had increased by 64 percent, and the number employed in nursing positions had risen by 81 percent. The ratio of active nurses to population had risen by 50 percent. The 1970 requirement of 850,000 employed nurses had been exceeded and a revised standard for 1975 of one million employed nurses had almost been reached.[10]

- Compensation: Nursing salaries increased substantially between 1962 and 1975. Starting salaries for general duty nurses rose 141 percent over the period--a 36 percent increase in real income. Relative to salaries of women in other occupations,* nursing wages rose 18 percent.[11]

- Vacancy Rates: Data on vacancy rates were not collected on a systematic basis after 1971, but between 1962 and 1971 the vacancy rate was reduced by more than half (from 23 percent to nine percent).[12]

- Labor Force Participation: An important source of the increase in employed nurses between 1962 and 1975 was a substantial increase in the labor force participation rate. Employed nurses as a percentage of licensed nurses increased from 65 to 72 percent during the period, and the increase in the participation rate accounted for about one fifth of the increase in working nurses.[13]

- Distribution of Nurses: One aspect of the nursing market did not improve substantialy between 1962 and 1975--there was little reduction in the regional disparities in the ratio of nurses to population. Although the ratio increased in all areas, disparities of a factor of 2.0 or more still existed across states.[14]

In an era of serious efforts to reduce the growth of the federal budget, evidence of continuing problems in the nursing market was not strong enough to prevent Presidential vetoes of NTA legislation.

1.3 Changes in Nursing Education

Nursing education is unique among the health professions: basic (undergraduate) preparation is provided by three distinct educational programs. The diploma (nondegree) program, generally of three years' duration, is a hospital-administered program that provides extensive acute care experience. The baccalaureate (BSN) program offered by colleges and universities and

---

*Professional, technical and kindred female workers, the most frequently cited reference group for nurses.

generally of four-year duration, emphasizes behavioral and scientific principles underlying the practice of nursing in all settings. The associate degree (AD) program, generally requiring only two years of study and offered by community colleges, places particular emphasis on the skills needed in hospital settings.

Between 1964 and 1979, enrollment in basic nurse training programs increased by 84 percent, and the number of students graduating from nursing programs increased from about 32,000 to about 78,000.* The rate of expansion has not been constant, however. Between 1964 and 1971, the average annual increase in new nursing graduates was slightly above five percent, but the rate of increase jumped to over 11 percent for the years between 1971 and 1975. After 1975, the number of graduations per year remained relatively constant for a few years and then began to decline.[15]

The most dominant trend in nursing education has been a shift in the locus of training from the formerly predominant hospital diploma programs to BSN and AD programs. In 1964, about seven out of every ten nursing students were enrolled in diploma programs. By 1979, about 60 percent of these programs had closed, and their share of total enrollment had fallen to 18 percent. Over the same period, the number of BSN programs doubled, and their share of total enrollment increased from 21 to 42 percent. AD programs recorded the largest growth: 558 new programs and an eleven-fold increase in enrollments (see Table 1).

---

*Graduate training in nursing has also expanded, in part as a result of greater demand for nursing faculty (particularly in BSN programs). The number of schools offering graduate programs has more than doubled since 1964, and there has been a threefold increase in graduations from masters and doctoral programs.

Table 1

ENROLLMENT AND NUMBER OF NURSE-TRAINING PROGRAMS

	1964	1969	1971	1975	1979
Enrollment	129,269	150,795	187,551	250,385	237,580
Diploma	93,089	72,798	71,466	60,213	43,651
Associate	8,518	34,537	56,300	89,492	93,485
Baccalaureate	27,662	43,460	59,785	100,680	100,441
Number of Programs	1,158	1,339	1,363	1,375	1,389
Diploma	840	695	587	428	330
Associate	130	390	491	618	688
Baccalaureate	188	254	285	329	368

Source: Various issues of ANA's Facts about Nursing

1.4 Previous Studies of the Impact of Federal Support for Nursing Education

Another factor likely to have influenced the rate of growth and the composition of nursing education is the financial assistance provided under the NTA legislation. Between fiscal years 1965 and 1979, over one billion dollars was awarded to nursing schools for loans and scholarships, for construction and special project grants, and for formula and capitation grants (see Table 2). Although it is reasonable to believe that this assistance influenced the behavior of both schools and students, there is relatively little hard evidence on the effects of the NTA programs.

Table 2

FEDERAL FUNDS AWARDED TO SCHOOLS OF NURSING[1] BY TYPE OF AWARD BY YEAR, 1965 TO 1979 (in millions of dollars)

YEAR	CONSTRUCTION	CAPITATION[2]	SPECIAL PROJECTS[3]	LOANS AND SCHOLARSHIPS	TOTAL
1965	0	0.8	2.0	3.1	5.9
1966	7.4	2.1	1.9	7.5	18.9
1967	27.4	3.1	3.5	16.2	50.2
1968	19.4	3.0	4.0	18.5	44.8
1969	18.6	3.0	4.0	14.4	40.0
1970	7.9	0	7.0	20.3	35.2
1971	7.9	0	11.4	33.7	53.0
1972[4]	11.4	31.5	30.9	74.9	148.7
1973[4]	9.5	38.5	12.2	34.4	94.6
1974[4]	5.7	34.3	32.0	18.8	90.9
1975[4]	16.5	34.3	33.8	29.0	113.7
1976[5]	34.6	43.0	20.0	42.4	136.1
1977	0	39.6	23.8	29.2	92.6
1978	3.5	29.7	27.6	31.6	92.5
1979	0	23.6	27.7	23.1	74.5
TOTAL	170.0	282.7	241.9	397.1	1091.7

Source: Unpublished data from Bureau of Health Professionals.

[1] Includes some funds awarded to nonbasic programs (e.g., graduate programs); excludes awards in categories of traineeships, advance nurse training, educational research grants, fellowships, and research training grants.

[2] Includes formula grants to diploma programs (FY 1965-1969).

[3] Includes awards in categories of financial distress, start-up, full utilization of educational talent, and nurse practitioner.

[4] Funds obligated but impounded in FY 1973 are included in FY 1974 and FY 1975.

[5] Includes transition quarter between FY 1976 and FY 1977.

Several researchers have used a case study approach to determine the effect of federal support for nursing education. Creason analyzed the use of federal funds by a small sample of nursing schools.[16] Although the schools had become increasingly dependent on federal funds to cover basic educational costs (e.g., faculty salaries), there were numerous examples of schools' using the monies for innovation and programatic improvements. Miller and Byrne studies the effects of NTA awards by interviewing state officials and nursing leaders in six states. They reported that "virtually every discussant described capitation and other training act funds as invaluable assistance in meeting the critical nurse shortage that existed some years ago."[17] They also reported complaints, however, that capitation funds went to support unnecessary expansion and encouraged the recruitment and retention of marginal students. Lawrence Johnson and Associates examined the degree to which NTA programs had achieved their goal of increasing the number of minority-group nursing students.[18] They found that the loan and scholarship programs were the most effective forms of federal support in this regard. Although all of these studies provide useful insights, they offer no numerical estimates of the number of additional students or the number of additional programs fostered by the NTA.

Altman was one of the first researchers to use statistical techniques to examine the effects of NTA funding.[19] He used multiple regression analysis to estimate relatively simple models of the number of students admitted nationwide to basic nurse-training programs in each of the years bettween 1956 and 1968. Two types of variables were included in his models to represent NTA funding--either the proportion of students enrolled

in nursing schools who received NTA loans or a dummy variable having a value of 0.0 in years before the start of NTA programs and a value of 1.0 in years thereafter. In Altman's view, the results did not support the hypothesis that the loan provisions of the NTA significantly added to the flow of new enrollments.

Cresap, McCormack, and Paget used a very simple statistical technique to test for relationships between different types of federal aid (e.g., capitation, student assistance, construction grants) and different measures of number of nursing students (enrollment, graduations, and admissions).[20] Significant simple correlations were found for each of the three years studies (1971-1973). No effort was made to test for simultaneous effects of each of the different types of aid, to control for the effects of other variables which might influence number of students (e.g., number of high school graduates), or to convert the results to numerical estimates of the number of additional students produced by NTA funding. Most damaging of all, no recognition was given to the possibility that a tautalogical relationship--of large schools receiving a large amount of funding--might produce the appearance that an increase in aid would lead to an increase in number of students. The limitations of this study make it a weak basis for any conclusions about the effectiveness of NTA funding.

Yett used a deductive approach in analyzing the potential effectiveness of federal support for nursing education.[21] He argued that loan and scholarship programs are not likely to increase the number of nursing students unless the student aid significantly increases the rate of return

that students receive from investing in a nursing education.* His calculations indicated that the rate of return for a nursing education was only marginally improved by NTA loans in the late 1960s but more substantially increased by NTA scholarships.

In his analysis of the effects of NTA funding, Edgren also used a deductive approach.[22] He noted that, by 1972, a maximum of 13,331 nursing graduates could have made use of the additional "places" in AD and BSN nursing programs which were created by NTA construction grants.** He also estimated that, by 1972, a total of 38,333 new graduates had received NTA loans and/or scholarships in their first year of nursing school. He deflated both of these figures by the proportion of program costs covered by federal aid*** and adjusted for the fact that an estimate of NTA effect based on the sum of both figures would involve double counting. To determine the numbers of additional working nurses due to NTA funds, he deflated his estimates of additional graduates by the average labor force participation rate. Based on his approach, NTA construction grants and student aid caused an increase of about 9,300 in the size of the active nursing workforce in 1972—an increase of

---

* The return to education is measured on the basis of the present value of future increments to income (increases due to educational attainment) relative to educational costs (out-of-pocket expense plus earning foregone while in school).

** Edgren ignored the additional places created in diploma schools, arguing that the fact that enrollments in diploma programs were declining nationally meant that any additional capacity created in diploma programs was unneeded and unused.

***For example, since construction grants paid only half of construction costs in some years (matching funds required), only half of the extra "places" (and half of the students using those places) should be attributed to NTA funding.

about 1.2 percent.* Due to the untested and unsubstantiated assumptions that are the basis of Edgren's methodology,** the reliability of his results is unknown.

In 1981, Hixson and other staff at the Bureau of Health Professions estimated a model of the determinants of number of nursing graduates that is very similar to the one used by Altman ten years earlier. The data to which the model was applied were national aggregates for the years between 1956 and 1979. They found no positive relationship between number of nursing graduates and number of dollars appropriated for capitation, student assistance, or the combination of all NTA programs. They conclude that "the rapid growth of the number of nursing graduates in the 1970s appears to have been the result of market forces operating chiefly on the demand for health care rather than direct federal support for nursing education."[23]

1.5 Studies Not Specific to Nursing Education

A number of empirical studies have examined the effects of student aid programs and of changes in the cost of postsecondary education on the proportion of high school graduates who choose to undertake additional education. Although these studies do not speak directly to the effects of NTA programs, their findings can be used to establish a rough lower bound on the potential effectiveness of the loan and scholarship programs authorized by NTA legislation.

---

* Edgren made a number of computational errors in his calculations. His calculations were redone to derive the estimate presented here. The 9,300 additional active nurses constitute about 3.8 percent of the increase, from 1966 to 1972, in the workforce due to new nursing graduates.

**Two assumptions to which Edgren's estimates are very sensitive are: (a) that only about half of number of "places" and of the number of aided students can be attributed to NTA funds because federal monies covered only about half of construction and student costs; and (b) that since federal support could have had no effect, the best point estimate of the impact of construction grants and student aid is half of the "maximum" effect. These two assumptions discount the maximum effect by 75 percent (1 - 0.5 x 0.5).

The various studies of the relationship between enrollment rates and educational costs have produced relatively consistent findings.[24]

- The proportion of high school graduates choosing to enroll in postsecondary programs is sensitive to the students' educational costs. This has been demonstrated by at least a dozen studies, making use of diverse types of data and employing a variety of analytic models and statistical techniques.

- A decrease of $100 in annual educational costs (1974 prices) would increase total postsecondary enrollment by 0.2 to 5.0 percent. The price responsiveness of enrollment is about twice as high for students from families with incomes of $9,000 as for students from families with income of $12,000 (again, at 1974 prices).

- When findings about price responsiveness are converted to inferences about the effectiveness of financial aid programs, one concludes that a program of universal aid is a relatively expensive mechanism for increasing participation in postsecondary programs. Under a universal aid program, each additional person encouraged to enroll as a result of financial assistance would cost $4,000 at 1974 prices.

- An aid program targeted at students for whom price responsiveness is highest (i.e., low-income students) is more cost-effective than an universal program but, because it reaches fewer students, produces a smaller absolute increase in enrollment.

- A reduction in educational costs (or increase in student aid) in only one sector of the educational system, produces a much larger effect for that sector than a system-wide reduction produces for the whole system. If costs elsewhere remained unchanged, a decrease of $100 in students' costs (1974 prices) for junior colleges, for example, would shift as much as three percentage points of the high school graduating class to that sector--partly through reductions in enrollment elsewhere and partly by increasing the overall enrollment ratio.[25]

One of the interesting features of these studies from a methodological perspective is that empirical results do not seem to be very sensitive to the type of data used for analysis--annual data on total enrollment and average educational costs at the national level, cross-section data on costs and enrollment at specific educational institutions, or cross-sectional data on the choices made by individual high school graduates.

Rather than inferring the effects of financial aid from estimated relationships between enrollment and educational costs, Jackson examined the impact of financial aid directly.[26] His data were drawn from the National Longitudinal Study of the high school class of 1972 and provided detailed information on a sample of 4,375 individuals. Among the most important of his findings were the following:

- For about 85 percent of high school graduates, the decision of whether or not to undertake additional education is predicted by such variables as the characteristics of the areas in which they live, the students' background and academic qualifications, and the characteristics of available postsecondary programs. This leaves relatively few students for whom the enrollment decision is likely to be influenced by student aid.

- Since 85.2 percent of the high school graduates in the sample who had received an offer of financial aid entered college but only 78.0 percent of those without such offers entered college, an unadjusted (for other determinants) estimate of the effect of aid is a 7.2 percentage point increase (85.2 - 78.0) in attendance.

- When all other determinants are controlled for statistically, receipt of financial aid increases the frequency of college attendance by 8.5 percentage points. Thus, ten percent of those attending college with financial aid (8.5/85.2) would not have done so without the external support.

- The data indicate that whether or not a student receives aid is a more powerful determinant of the enrollment decision than is the amount of aid received.

Jackson's overall assessment of the effectiveness of financial aid as a mechanism for increasing college enrollments was "somewhat pessimistic": there are relatively few potential students whose decisions on whether to go to college are likely to be influenced by financial aid, and it is very difficult to design an aid program that is targeted at just that group.[27]

Although one must be very careful in using the results of these general studies to address the specific question of the effectiveness of NTA programs, some extrapolations do seem reasonable. First, the general studies do provide a solid body of evidence that financial aid for nursing students

should have increased enrollments. Second, the studies indicate that of those nursing students who received NTA loans and scholarships, at least, 10 percent would not have attended nursing school without the aid. The actual percentage impact is probably larger, since NTA funding will not only induce additional high school graduates to undertake further education (the 10 percent effect that Jackson derived) but will also draw students into nursing programs who would have enrolled in a different type of postsecondary education.* Finally, the general studies emphasize the importance of setting a realistic standard for evaluating the effects of NTA programs. Those who believed that federal support for nursing education could increase the number of nursing students by 50 percent between 1965 and 1970 were very unrealistic in their expectation.**

The last point, about realistic expectations, is very important. To provide a rough, first approximation of the effect of NTA funding, one can utilize the simple methodology suggested by Jackson--a comparison of the percentage of students attending nursing school among those students who received financial aid with the corresponding percentage among students not receiving aid. Data drawn from a 1974 survey by the National League for Nursing provide the following breakdown:[28]

	Total	Enrolled	Percentage
Students Admitted With Aid	422	335	79.4
Students Admitted Without Aid	1,282	817	63.7

*The general studies we have reviewed do not examine the effects of institutional aid designed to improve educational quality (e.g., capitation and special project grants) or to increase educational capacity (e.g., construction awards). This is a second reason that Jackson's estimate of a ten percent effect is likely to understate the impact of NTA funding on admissions at nursing schools.

**The Surgeon General's Consultant Group on Nursing called for nursing schools to increase their graduations to 53,000 by 1970, a 51 percent increase over the 35,125 graduations in the 1965-1966 academic year.

Jackson's methodology yields the result that financial aid increased the enrollment ratio for students receiving aid by 15.7 percentage points (79.4 - 63.7 = 15.7). In effect, 19.7 percent of the students receiving aid (15.7/79.4) would not have attended nursing school without the external assistance. The reader may recall that Edgren's methodology for estimating the effect of NTA loans and scholarships implicitly attributed about 25 percent of admissions at funded programs to the effects of the NTA. Even using this higher figure (25 rather that 19.7 percent), he demonstrated that NTA funding produced a relatively small increment in the size of the active nursing workforce. Edgren's results should be interpreted not as a indictment of the NTA programs but as a rough approximation for the effects that one could realistically expect from a program which, by 1972, had relatively little time to influence the educational system and the nursing workforce.

1.6 Implications for Research

The information that has been presented thus far is intended as background for the remainder of the report. In part, a context has been provided for our analyis of the effects of NTA funding. In addition, what has been discussed thus far has important implications for the methodology of our analysis.

Perhaps the most important point that has been established is the need for realistic expectations about the probable magnitude of effects of NTA funding on nursing school enrollments and, thereby, on the size of the nursing workforce. Early expectations of the increase in nurses that could be achieved by federal assistance were unrealistic. The size of the federal program in the 1960s was too small and the length of the educational pipeline too long for a large increase in graduations to have been brought about by as

early as 1970. The increase in NTA appropriations in the 1970s should have increased the impact of the program to some degree, but the evidence of previous research still suggests cautious expectations about the magnitude of estimated effects.

The contrast in findings between statistical studies of NTA programs (Altman and Bureau of Health Professions) and similar studies of general assistance to postsecondary education establishes a second point. The countervailing evidence is too strong to be able to accept findings that NTA funding has had no effect on enrollments in nursing schools. A thorough statistical evaluation, based on the full set of available data, will hopefully yield estimates of the NTA's effectiveness that are consistent with available research on the effects of general assistance to postsecondary education.

The discussion of the chronology of NTA programs and of the nature of the system of nursing education has three important implications for the type of statistical analysis that is appropriate. First, we should examine federal support for nursing education not as a monolithic program extending from the mid-1960s to the present but as a succession of programs resulting from frequent changes in federal legislation. Second, the analysis should be directed to distinguishing the relative effectiveness of the different types of assistance provided under the authority of the NTA--as a guide to the federal government and to states as to which types of assistance to emphasize in the future. Third, the analysis should be conducted separately for each of the types of basic educational programs--diploma, associate, and baccalaureate--for they represent very different educational models and have exhibited very different rates of growth and contraction.

Finally, a caveat presented at the very beginning of this report should be reemphasized. Whatever estimates are later provided for the effects of NTA funding on nursing enrollments, the results will significantly understate the overall effects of the NTA on the nursing workforce. This is so because federal support for nursing education sought to achieve other goals than an increase in enrollments. The effects of federal programs on the quality of nursing education, on minority recruitment, and on advanced nurse training are not evaluated in this report.

2.0 ANALYTIC METHODOLOGY, STATISTICAL TECHNIQUES, AND DATA

This section of the report presents the major features of our procedures for estimating and testing the effects of NTA funding on nursing education. Four topics are discussed: (1) the research questions our empirical analyses address; (2) the general approach we used to estimate and test the effects of federal aid; (3) the methods we used to overcome certain estimation problems; and (4) the data that are used in our analyses.

2.1 Research Questions for Empirical Analysis

The research questions we will address in our empirical analyses are summarized below.

- Did NTA funding increase the number of graduations from nursing schools between 1965 and 1979 and, if so, by how much?
- How did the effects of aid on graduations occur--by means of a change in the number of admissions, as the result of a change in retention rates, or as the consequence of a combination of both types of changes?
- Did federal aid have similar or different effects across the three different types of basic nursing-education programs--diploma, associate, and baccalaureate?
- Did different types of NTA funding--construction grants, capitation, loans, and scholarships--have differential effects on the number of nursing students?
- Did NTA funding have differential effects across states with different ratios of nurses to population?
- Did the distribution of federal aid vary systematically--by type of program, size of school, or nurse-to-population ratio?

Each of these questions is discussed briefly below.

One of the principal hypotheses that we test is that NTA funding increased the number of nursing graduates. A high priority is attached to the analysis of number of graduates because a primary rationale for NTA

legislation was the need to increase the size of the nursing workforce. It should be noted that an analysis of number of graduates is more directly relevant to understanding impact on workforce size than is an analysis of number of admissions. A finding, for example, that NTA funding has lead to a 15 percent increase in number of admissions does not translate very directly into a statement about effects on the size of the workforce. If retention rates (percent of admitted students who ultimately graduate rather than drop out or transfer) are also influenced by NTA funding, the total effect on new workforce entrants may be less than (reduced retention) or greater than (increased retention) the 15 percent impact on number of admissions.

The second principal hypothesis we test is that NTA funding increased the number of admissions to nursing schools. Since we believe that an important rationale for NTA programs should be to provide equitable access to nursing careers, we contend that nursing-school admissions is a very important outcome variable in our study. If we can demonstrate that a high proportion of assisted students would not have entered nursing programs without the external support, we will have shown that the NTA programs were efficiently targeted and effective in increasing access. If the results imply that only a small proportion of assisted students entered nursing programs as the result of the NTA, we must conclude either that access was not a serious problem (and federal support had little potential for effect) or that previous NTA programs were not efficiently targeted.

One of the potential drawbacks of any program of educational assistance is that it will attract marginal students who later drop out or transfer to other programs. When this occurs, there is a loss to both the student (loss of time and earnings) and the government (no return to

funding which could have been used productively in another fashion). As was mentioned earlier, Miller and Byrne reported complaints from a half dozen states that the incentives built into NTA programs caused nursing schools to recruit marginal students.[29] By analyzing the relationship between NTA funding and drop-out rates, we hope to indicate the degree to which some of the potential benefits of federal support may have been lost through increases in attrition rates. It is also possible, of course, that NTA funding has led to a decline in attrition rates and thereby enhanced the value of federal assistance.

For several reasons, it is important to look for differences in effects of federal assistance across the three types of basic nurse-training programs. First, separate analyses by type of program are consistent with previous findings that financial assistance had a differential impact on students' returns to education (and, thereby, on incentives for enrollment and retention) across the three types of programs.[30] By conducting our analyses seperately for each type of program, we allow for and can test for the existence of differences in the effects of NTA funding from one type of program to another. Second, the fact that federal legislation differentiated eligibility requirements and funding levels for NTA assistance across types of programs suggests that relative effectiveness has been and may continue to be a policy issue that our analysis should consider.[31] Finally, the dramatic changes in the composition of the education system--the decline of diploma programs and the growth of associate and baccalaureate programs--means that predictions of future effects must be based on separate projections by type of program.

One can interpret the various changes in the types of assistance made available under NTA legislation as an ongoing experiment with alternative types of programs. For our study to be useful for the future, it should examine the relative effects of each major form of assistance that has been used--student aid, construction grants, and other types of institutional assistance. As a result, we specify our evaluation model in such a way that it can indicate both the separate and combined effects of each major type of funding.

One of the problems that some hoped the NTA would reduce over time is the imbalance between the geographic distribution of nurses and population. No major effect was made to channel NTA funds for basic nursing programs to areas with low ratios of nurses to population,* although some incentives to redistribution were incorporated into special project grants, repayment terms for students loans, and eligibility criteria for capitation funds. These incentives are too subtle to be evaluated directly in a statistical analysis of a large set of data.** Nevertheless, we do make a modest attempt to examine effects on geographic distribution--by testing for differentials in the effects of NTA funds on admissions between schools located in areas with low nurse-to-population ratios and schools located in areas with higher ratios.

---

*It should be noted that geographic mobility of nurses would reduce the usefulness of any effort to target federal assistance heavily to underserved areas.

**Our data are not specific enough to distinguish specific awards of funds designed to improve distribution. Further, we cannot measure the effects of the locational incentives built into the repayment terms of student loans by examining patterns of admissions and graduations, for these incentives would have affected the decisions that nurses make about where to practice after they have left their training programs.

The final research question to be addressed in our empirical analysis is how federal aid has been allocated across programs and areas. Allocation of aid may vary across programs and areas for several reasons. First, the objectives of the legislation itself may dictate what types of programs are to receive aid. Second, the federal agency administering the monies may develop a more specific set of criteria to follow in determining recipients of aid. Finally, there may be characteristics of the nursing program which influence whether or not the school applies for various types of funding. It should be noted that the distribution of aid is the result of the decisions made by schools themselves as well as by federal legislators and program administrators. Whether we find that the distribution of aid is consistent or inconsistent with federal legislative objectives, program administrators will deserve neither all of the credit nor all of the blame. In any event, our objective is not to identify responsibility, but to understand the determinants of allocation, as a basis for interpreting findings about the effects of aid on number and characteristics of new graduates from nursing schools and the effects of aid on the size and characteristics of the system of nurse-training programs.

As we will explain in more detail below, the effects of aid on number of graduates will be studied by comparing trends in graduations between schools which received federal aid and schools which did not receive aid. To be confident that a difference between trends for the two categories of schools reflect the effects of aid and is not the result of nonrandom selection of the recipients of aid, we must have a clear understanding of the determinants of allocation of aid across schools. Our

study of the pattern of allocation of federal aid will focus on three specific issues.

- Underserved Areas. Did programs in areas with low ratios of nurses to population receive federal aid with a higher, equal or lower frequency than did programs in areas with high ratios of nurses to population?

- Type of Program. Have programs of one type (e.g., bacalaureate) received aid with higher frequency than did programs of another type (e.g., diploma)?

- Education Capacity. Did frequency of receipt of federal aid vary by size of program?

2.2 General Research Strategy

To measure the impact of federal aid on the number of students admitted to nurse training programs, one must compare actual admissions to the number that would have occurred had no federal aid been received. If this comparison can be made, the effect of federal aid is measured by the difference between what actually happened and "what would have happened." Even brief reflection indicates that the prime obstacle to measurement of the effects of aid is that no data are available on the number of admissions that would have occurred in the absence of federal aid. The topic of this section is to describe the strategy we use to derive an imputed value for number of admissions in the hypothetical situation of no aid having been received.

Because the terms "number that actually occurred" and "number that would have occurred" are awkward to use, we will replace them with a shorthand notation in the discussion that follows. In addition, we want to discuss a general approach for estimating the effects of aid on all outcome variables of interest--admissions, attritions, and graduations. We will use the symbol Y to denote the actual, observed value of any of these outcome variables and the symbol Y* to denote the value that would have

occurred in the absence of federal aid. Our measure of impact, therefore, is Y-Y*, and our general research problem is to devise a method for imputing a value for Y*.

One strategy for deriving an imputed value for Y* is suggested by the fact that not all nurse training programs have received federal aid. If one could confidently assume that all external influences on recipients and nonrecipients of aid were identical except for receipt/nonreceipt of federal funds, then the values of Y for nonrecipients should reflect the values of Y* for recipients. That is, actual admissions from schools not receiving aid should indicate what admissions would have been at recipient schools had no federal aid been available. Impact of aid could then be measured straightforwardly, as the difference in the average values of Y between the two groups of schools.

The obvious flaw in this approach is that one cannot assume with confidence that all external influences except receipt/nonreceipt of aid are identical between the two groups of schools. For example, preliminary analysis of available data indicate that large schools received aid with higher frequency than small schools and that diploma programs received aid with lower frequency than did associate and baccalaureate programs. In addition, since some form of accreditation or approval was a qualification for receipt of most types of aid, recipient schools and nonrecipient schools should be different in a variety of other ways. As a result, when one compares the average value of outcome variables between the two groups of schools, effects of federal aid are likely to be confounded with the effects of differences in a variety of other factors--size, type of program, maturity, etc. This confounding of effects can be reduced and possibly eliminated

by careful statistical procedures. Before we discuss the use of these procedures, two other general research approaches are presented.

A second strategy for deriving an imputed value for Y* is suggested by the fact that the availability of federal funds has changed over time. During the period for which we have data (1965 to 1979), some programs received federal aid during some years but not during other years. We can measure Y as the value of an outcome variable in years during which aid was received. Can we not reasonably measure Y* as the value of the same outcome variable in years during which no aid was obtained? The answer depends, of course, on whether or not other factors than receipt/nonreceipt of aid changed over time. Since the population of eligible nursing students, faculty salaries, nursing wage rates, and a variety of other potentially important factors have changed over time, it seems unreasonable to attribute year-to-year changes in admissions or other outcome variables to difference only in the receipt of federal aid.

A third approach, and the one we use in this project, is a combination of the two approaches discussed above. The first approach is a cross-sectional analysis, for outcome variables are compared across a cross-section of programs at a given point in time. The second approach is a time-series analysis, for outcome variables are compared across years for a given set of programs. We use data on all programs for each of the years from 1965 to 1979, inclusive. The statistical technique simultaneously compares outcomes across schools (recipients and nonrecipients) and across years (with and without aid). Such an approach is called a combined (pooled) cross-section/time-series analysis. Our observations are school-years, and we contrast outcomes (e.g., number of graduates) in school-years in which aid

was received with corresponding outcomes in years in which aid was not received.

Even with the combined approach, we must still deal with the problem that external factors other than federal aid are likely to affect the outcome variables of interest. Since these other factors are likely to vary both across schools in any given year and across years for any given school, the necessity of controlling for these other factors is even more important with our combined approach than with either the cross-section or the time-series approach used by itself. As we will show, the advantage of the combined approach is that it makes controlling for these other external factors much easier than would be the case if either the cross-section or time-series approach were used in isolation.

The standard method for isolating the effects of many potential causal variables is multiple regression analysis. One begins by specifying the mathematical relationship between the outcome variable (Y) and hypothesized causal variables (X_1, X_2, . . .):

$$(1) \qquad Y = b_0 + b_1X_1 + b_2X_2 + \ldots$$

In this example, the relationship is assumed to be linear,* and the b's are assumed to be constants which apply to all institutions and all years. In the context of the problem we are considering here, X_1 might represent federal aid, and the other Xs would represent the other factors which influence the outcome variable. When multiple regression analysis is used to fit the model to available data, the estimate of b_1 that is derived is a

---

*The effect of an increase in X_1 or Y does not depend on the value of X_2.

measure of the effect of a change in the variable representing federal aid on the outcome variable, with the effects of all other variables controlled for by the statistical technique. For this approach to produce a reliable estimate of the effect of aid, the form of the mathematical model must be specified correctly, and all of the important causal variables must be included on the right-hand side of the equation.

The problem that the combined cross-section/time-series (CS/TS) approach handles in an excellent fashion is a common difficulty--the absence of data on or the inadvertant omission of an important causal variable. Suppose the correct model to explain variations in Y is the following:

(2) $$Y = b_0 + b_1 AID + b_2 X_2 + b_3 X_3$$

and that we lack data with which to measure X_3. We now must estimate an abbreviated version of the model:

(3) $$Y = b_0 + b_1 AID + b_2 X_2$$

If X_3 and AID are correlated across schools and/or across years, the estimation method will treat the variable AID as representing not only federal aid but X_3 as well. The estimated value of b_1 that we can expect to derive will then be biased, reflecting the combined effects of variations in AID and variations in X_3. A more reliable estimate of the effect of aid will be obtained if the following terms are added to the equation:

(4) $$Y = b_0 + b_1 AID + b_2 X_2 + (a_2 S_2 + a_3 S_3 + \ldots + a_n S_n) + [c_2 T_2 + c_3 T_3 + \ldots + c_n T_m]$$

where:

S_i = 1 if the observation pertains to the i-th school; 0 otherwise (n equals the number of schools in the cross section);

T_j = 1 if the observation pertains to the j-th year; 0 otherwise (m equals the number of years in the time series).

The terms in parentheses account for differences in the value of the omitted X_3 across schools in the average year, and the terms in brackets account for variations in the value of the omitted X_3 across years for the average school.

When multiple regression analysis is applied to this expanded version of the model, the estimated value of b_1 should reflect quite accurately the effect of federal aid, for the additional terms in the model will pick up most of the effect of the omitted X_3. It no longer matters if X_3 varies across schools, nor does it matter if X_3 varies over time. Bias will remain only if X_3 varies across schools and varies over time and varies in a patterm which mimics the variation in receipt/nonreceipt of aid both across schools and over time. In short, very strict conditions must be met for one to expect the results obtained from the expanded model to be biased.

For actual statistical application, a modified version of the expanded model is used. An attempt to estimate directly the model implied by equation 4 would require the use of more than one thousand dummy variables, one for each of the nursing schools in the data set. Instead, we measures each of the variables in the model as deviations from its mean for each given school across the years in the time series. The value Y' of the i-th school in 1974, for example, is measured as the 1974 value of Y for that school less the mean of Y for that school across all the years for which data are available for that school. The same procedure is used to measure AID', X_2' and T_2' through T_m'. The school-specific dummy variables then drop out (i.e., $S_2' = S_3' = \ldots = S_n' = 0.0$). The model which is actually estimated then becomes:

$$(5) \qquad Y' = b_1 AID' + b_2 X_2' + c_2 T_2' + c_3 T_3' + \ldots + c_n T_n'$$

The attractive feature of this revised equation is that the statistical estimated obtained for b_1 may still be given the same interpretation as before--the increase in Y which results from a school's receiving federal aid. The name often used for the procedure we have just described is estimation of a "fixed-effects" model.*

According to the procedures we have described thus far, our evaluation plan has the following general features:

- We use data for each of the 14 years from 1966 to 1979 for each of the nurse training programs in existence for any portion of that period.**
- We will determine the effects of federal aid on number of graduates (and other outcome variables) by contrasting the average value of the outcome variable between school-years for which aid was received and school-years for which no federal assistance was obtained.
- We isolate the effects of aid from the effects of other potential causal variables by using multiple regression analysis to separate the effects of each potential causal variable for which we have data.
- We include school-specific (implicit) and year-specific (explicit) dummy variables to avoid attributing to federal aid the effects of omitted variables.

This is the most robust evaluation approach which is available for dealing with the special problems we confront in estimating the effects of federal aid.

---

* The name derives from the fact that subtraction of school-specific means from both sides of the equation eliminates effects which are specific to each school but fixed over time.

**Limitations on the time period used for analysis will be mentioned below.

2.3 Special Estimation Issues

One of the major issues we confront in examining the impact of federal aid on various outcome variables is that the causal relationships that are likely to exist among variables are complex and interconnected. The following set of equations represents a simplified model of these connections:

(6) Number of Graduates = f_1 (Admissions in Previous Years, Retention Rate in Current and Previous Years);

(7) Enrollment = f_2(Admissions in Previous Years, Retention Rate in Current and Previous Years);

(8) Admissions = f_3(Program Quality, Student's Cost, Other Factors);

(9) Retention Rate = f_4(Program Quality, Student's Cost, Other Factors);

(10) Program Quality = f_5(Enrollment, Federal Aid in Current and Previous Years, Other Factors);

(11) Students Cost = f_6(Enrollment, Federal Aid, Other Factors);

(12) Federal Aid = f_7(Program Quality, Enrollment, Federal Legislation, HRA Guidelines, Other Factors);

The first two equations reflect accounting relationships between graduates or enrollment in the current year and a combination of admissions in previous years and the rate of retention for previously admitted students. Equations 8 through 11 are simplified representations of hypothesized casual relationships that one might use to explain variation in outcome variables across schools and over time. The last equation reflects the fact that whether a school receives aid and how much aid it obtains are dependent on characteristics of the program (e.g., accreditation or state approval).

Our purpose in presenting this model is to illustrate a number of facts that we must take into account in selecting an approach for estimating the effects of aid on an outcome variable such as number of graduates.

First, the values of outcome variables in any given year are influenced not only by aid received in that year but also by aid received in previous years. As such, there is a lagged effect. For example, number of graduates in 1975 was determined by admissions in a previous year (e.g., in 1973 for two year programs), and number of admissions in that previous year was affected by whether and how much aid the school recieved in that previous year. So number of graduates in 1975 was indirectly affected by aid in 1973. Second, one must be careful in interpreting the estimated value of the regression coefficient associated with the variable representing federal aid in some equations as a measure of the full effect of federal aid. In equation 10, for example, the regression coefficient for the variable representing aid would indicate the effect of an increase in aid on "program quality" for the case in which enrollment is held constant.* If federal aid affects enrollment, however, some of the effect of aid on program quality will arise indirectly, through the changes in enrollment which result from changes in aid. The coefficient of the aid variable would therefore reflect only a part of the effect of aid on quality. Third, the estimation methods used must take account of the fact that the amount of federal aid a school receives is itself an "outcome" variable (an endogenous variable), in that amount of aid is affected by enrollment and other characteristics of the school.

A number of the points raised above we deal with by avoiding estimation of behavioral equations, the type of equations represented in the model presented above, and estimate instead "reduced-form" equations. Reduced-

*We include enrollment as an explanatory variable in the equations for both quality and cost, to relect the possibility of economies of scale in educational programs.

form equations can be derived from equations 6 through 12 by algebraically manipulating the set of equations until an equation has been obtained for each outcome variable in which the variables on the right-hand side consist of only exogenous variables (non-outcome variables--those variables whose behavior is not explained by any of the equations in the model).* The reduced-form equation for number of graduates, for example, would contain on the right-hand side all "other factors" appearing in any equation in the model and a set of variables reflecting changes in federal legislation and HRA guidelines with respect to federal aid to nurse training programs.

There are several important reasons why we prefer to work with reduced-form equations rather than behavioral equations in our analysis of the effects of federal aid.

- Easier Specification of Explanatory Variables. The explanatory variables which appear on the right-hand side of behavioral equations include endogenous variables as well as exogenous variables. The right-hand side of reduced-form equations includes no endogenous variables but does include all exogenous variables that appear in any equation in the model.** Most researchers believe that it is easier to identify the complete set of exogenous variables than it is to specify the precise form of each behavioral equation.

---

* The existence of lagged dependent variables in structural equations and any nonlinearities in the functional form of behavioral equations is likely to preclude actual algebraic derivation of reduced-form equations. There are two options: (1) derive the reduced-form equations in implicit functional form and then use a linear or nonlinear approximation to the true form; or (2) do not eliminate the lagged dependent variables, leaving them in the reduced-form equations as predetermined variables. The second approach does not circumvent the problem created by nonlinearities in the original behavioral equations.

**If a behavioral model is recursive (one endogenous variable influences another but not vice versa), some exogenous variables may not belong in the reduced-form equations for some endogenous variables. When this occurs statistical tests should indicate which variables do not belong in which equations. Statistical tests are less useful in choosing variables for inclusion in behavioral models because of the simultaneous dependence of endogenous variables on both sides of an equation on the same set of exogenous variables (spurious correlation).

- Easier Measurement of Total Effect of Federal Aid. In a behavioral equation, federal aid may have both a direct and indirect effect on the outcome variable being studied. The entire system of behavioral equations must be evaluated simultaneously to determine the total effect of aid on any outcome variable. The coefficient of the variable measuring federal aid in a reduced-form equation provides a direct measure of the total effect of aid on the outcome variable being analyzed.*

- Less Costly Estimation Techniques. To obtain reliable estimates of the coefficients in behavioral equations, one must use estimation techniques which take account of the fact that some of the variables on the right-hand side of equations are endogenous variables (outcome variables--those variables whose behavior is explained by one of the other equations in the model). Simpler, less costly estimation techniques can be used with confidence to estimate the coefficients of reduced-form equations.

It is for these reasons that we use reduced-form equations to analyze the effects of federal aid.

There is another important methodological problem which we have not yet discussed--the appropriate representation in our empirical model of a set of variables to represent federal aid. One's first inclination may be to represent aid by variables which measure the amount of money schools have received under each of the various aid categories. This approach has several potential drawbacks:

- Tautalogical Relationship. Among schools that recieve aid, large schools are likely to receive greater amounts of aid than small schools. In fact, some aid (e.g., capitation grants) was allocated according to a formula in which the primary determinant of the level of funding was size of enrollment. When one uses amount of aid as an explanatory variable for graduates, admissions or enrollment, one cannot be sure that the results reflect a dependency of number of students on aid or the tautalogical dependency of aid on number of students.

---

*Even more important, tests of statistical significance of the effect of aid are very simple to perform with reduced-form equations but are computationally very complex when one has estimated the system of behavioral equations.

- Need to Express Aid as Dollars-Per-Student. Variations in aid per student, rather than variations in total aid, are likely to influence both the decisions of students to apply to nursing schools and to remain in the program once enrolled and to influence the decision of schools to increase capacity. If one chooses to use amount of aid as a measure of the "treatment" produced by federal assistance, therefore, one should divide dollars received by the number of students across which the aid must be allocated.

- Amount of Aid as Endogenous Variable. If we use reduced-form equations to estimate the effect of federal assistance, to be technically correct we should not include any endogenous variables on the right-hand side of equations. As we pointed out above, the correct variables to use in true reduced-form equations are those which reflect changes in federal legislative provisions and in the guidelines used by HRA to administer federal assistance.

The specification we use to represent federal assistance consists of a set of dummy variables. For each major category of aid (e.g., capitation grants), we use four dummy variables.* The first of the four variables for a given category of aid is assigned a value of 1 for each year-school observation for which aid from that category was received between 1965 and 1969; otherwise a value of 0 is assigned. The same procedure is used to assign values of 1 or 0 to the other three dummy variables for the given category of aid, except that the reference years used are 1970 and 1971 for variable two, 1972 to 1975 for variable three, and 1976 to 1979 for variable four. Reference years have been chosen so that each dummy variable for a given category of aid pertains to the period covered by one version of the federal legislation which authorized aid to nursing schools.

What problems does our proposed specification reduce or eliminate? The use of dummy variables clearly circumvents the tautalogical relationship between amount of aid and number of students, for each school gets a score of

---

*Categories of aid represented in the model are discussed below.

1 if it recieved aid, regardless of the amount of aid recieved. The problem of amount of aid being an endogenous variable is circumvented for the same reason. The specification also provides a reasonably close approximation to the type of variables one would obtain by using aid-per-student to represent treatment. This is true for capitation grants, for example, because within legislative cycles the amount of aid received per student was generally either 0 or a constant across schools.*

Although we have discussed the fact that the amount of aid a school receives is an endogenous variable, we have not yet considered the possibility that whether a school receives aid may also be endogenous. Since some schools did not receive aid solely because they did not apply, self-selection is a factor in determining how aid is allocated. To the extent that a school's decision to apply for aid is influenced by how large it is,** receipt/nonreceipt of aid and number of admissions are likely to be jointly determined. Receipt of aid may lead to an increase in admissions, but an increase in admissions is likely to increase the propensity of a school to apply for aid. By testing for the existence of the first type of causality but ignoring the possibility of the reverse relationship, one may expect statistical results which are contaminated by what is referred to as simultaneous equations bias.

---

*Extra aid for bonus students and no aid for part-time students caused the amount of aid received per student to fluctuate somewhat across years and across schools. Note that a dummy variable would be perfectly correlated with a variable measuring aid per student if the latter took on values of only zero or a constant across years and schools.

**Large schools should be more likely to apply than small schools because large schools can expect to receive a larger amount of money.

One possible response to the problems created by the endogeneity of receipt/nonreceipt of aid is use of estimation techniques developed by Heckman and others.[32] Unfortunately, their approach is virtually impossible to apply to the problem at hand because there are a dozen or more variables in our model which represent receipt/nonreceipt of aid--one for each legislative cycle for each category of fedeal assistance. The Heckman procedure has never been applied to a problem in which "treatment" is represented by such a large number of endogenous variables.

The procedure we have chosen to employ represents an approximate correction for the endogeneity of receipt/nonreceipt of aid. We conducted some preliminary tests and found that the frequency of schools' receiving aid is indeed very sensitive to large differences in size (measured by enrollment) but not very sensitive to small differences in size. As a rough correction for the problem of the endogeneity of our aid variables, therefore, we divide our sample of each type of nursing school into three categories: (1) small schools; (2) medium size schools; and (3) large schools. We then estimated our evaluation models separately for each size category for each of the three types of basic nursing programs. This procedure will not eliminate the potential for simultaneous equations bias, but it should reduce the severity of the problem.

Our general strategy for estimating the effect of federal aid can be summarized as follows:

- We use a combined (pooled) cross-section/time-series analysis in which the unit of analysis is a school year;
- Implicitly, we will assess the effects of aid by making comparisons of outcome variables between schools which did and did not receive aid in a given year and between years in which aid was and was not received for a given school;

- We include year-specific dummy variables and (implicitly) school-specific dummy variables to reduce or eliminate any bias caused by omission of one or more explanatory variables;
- We do not estimate the direct causal relationships among variables (behavioral equations) but estimate instead reduced-form equations;
- We represent federal aid--the "treatment" we are analyzing--with a set of dummy variables, one variable for each of four legislative cycles for each of three general categories of federal aid;
- We make at least a partial correction for the endogeneity of the dummy variables representing federal aid by estimating our models separately, not only by type of program but by size of program as well.

These procedures should provide estimates of the effects of federal aid which are relatively unbiased and relatively efficient.

To the extent we could afford to do so, we tested the sensitivity of our results to alternative specifications of the basic evaluation model. For each outcome variable, for example, we estimated the fixed-effects version of our model, a first-difference version, a percentage change version, and a version which involved no differencing of variables and no school-specific dummy variables but did include dummy variables for the state in which the school is located.* For the most part, each of these versions was estimated for each size category of school within each of the three types of basic programs. The results that are presented below are based on the

---

*The difference among the various models is most easily explained in terms of the measure used for the dependent variable. In models for admissions, for example, the fixed-effects model would have admissions measured for the i-th school in the t-th year as the number of students admitted in that school year less the average of admissions across all years in the data file for that school. For a first-difference model, the dependent variable would be expressed as the change from last year to the current year in admissions; the percentage change model simply expresses the year-to-year change as a percentage of admissions in the previous year. The last version of the model listed here (no differencing) contains admissions in the current year as the dependent variable.

fixed-effects version of our model--the version that, for the reasons discussed above, is the best likely to be adversely affected by omission of explanatory variables for which no data are available.

2.4 Variable Definitions and Data

One of the major tasks of the project was compilation of the data needed to implement the analysis plan described above. The requisite information includes: (1) annual admissions, attrition, and graduations from each school of nursing from 1965 to 1979; (2) amount of financial assistance received annually by each school under NTA programs by category of assistance; and (3) exogenous variables which measure the characteristics of the area in which each nursing school is located. Data were drawn from a variety of sources, carefully edited for internal consistency and for agreement with information from independent sources, and then converted to a format amenable to statistical analysis. A good part of the effort was devoted to constructing variables which conformed to the conceptual definitions of the evaluation model.

All data on numbers of nursing students, on characteristics of nursing schools, and (with an important exception discussed below) on financial aid were obtained on computer tape from the Health Resources Administration. For the years from 1965 to 1972, these data had been compiled for an earlier evaluation of NTA programs.[33] Data for later years had not previously been converted into a unified cross-section, time-series data file. Data on exogenous variables (listed on pages 48 and 49 below) were drawn from a file prepared by Abt Associates as part of an evaluation for the Health Care Financing Administration.

Variables measuring admissions, attritions, and graduations from nursing schools were defined and constructed in a relatively straightforward fashion. Graduations for year t include all students completing their basic programs between August of year t-1 and July of year t. Admissions for year t include all students entering basic programs between August of year t and July of year t+1. This configuration of start- and end-dates was chosen so that data for a given year would contain the summer graduations of that year and the fall admissions of that year. For 1979 only, admissions include students entering programs from August of 1979 to December of 1979.* A variety of techniques were tested for measurement of attritions. The formula finally chosen is the following:

$$\text{Attritions}_t = \text{Enrollment}_{t-1} - \text{Graduations}_t + \text{Admissions}_t - \text{Enrollment}_t$$

With this definition, attritions reflect the net effect of reductions in enrollment due to dropouts and transfers to other programs and increases in enrollment due to incoming transfer students.** The variable measures the net change in the sum of the size of all classes (seniors, juniors, etc.) in a given year rather than the net change in the size of a given class (e.g., the class of 1975) between admission and graduation.

In models used to explain number of admissions, the variables representing receipt/nonreceipt of funding under a major NTA category are the following:

---

* Since a 1980 data tape was not available, the abbreviated period had to be used. A comparison of admissions data for 1979 and earlier years indicates that the data for 1979 represent a modest undercount.

**Enrollment is student count as of October 15 of a given year.

- Formula Grants, 1965-1969--applies only to diploma programs; scored 1.0 in each year between 1965 and 1969 in which school received funds under the formula grant program; scored 0.0 otherwise;

- Loans/Scholarships, 1965-1969--scored as 1.0 in each year between 1965 and 1969 in which school received funds for student loans and/or (starting FY 1968) scholarships; scored 0.0 otherwise;

- Loans/Scholarships, 1970-1971--same scoring procedure as for the 1965-1969 period;

- Capitation, 1972-1975--scored as 1.0 in each year between 1972 and 1975 in which school received funds under the capitation grant program; scored 0.0 otherwise;

- Loans/Scholarships, 1972-1975--same scoring procedure as for the 1965-1969 period except also scored as 1.0 in each year in which school received a grant for Utilization of Nursing Educational Talent;

- Capitation, 1976-1979--same scoring procedure as for the 1972-1975 period;

- Loans/Scholarships, 1976-1979--same scoring procedure as for the 1972-1975 period; and

- Construction, 1965-1979--sum of the number of construction grants school received between 1965 and the current year.

For formula grants, loans/scholarships, and capitation grants, we hypothesize that admissions are affected only if NTA funding is received in the current year. Since construction grants produce a long-term increase in capacity or a long-lasting renovation of the existing plant, we hypothesize that admissions are affected not only in the year in which the grant is received but in subsequent years as well.

In models used to explain attritions and graduations, the definition of the aid variables is revised to reflect a hypothesized lag. As we noted above (pages 34-35), the behaviorial model underlying our analysis implies that graduations in one year (e.g., 1975) are influenced by aid received at the time the current graduating class first entered nursing

school (e.g., 1973). Further, the model implies that the retention rate for all classes in a given year is influenced by receipt of aid in the just-ended year as well as by receipt of aid in previous years. We, therefore, hypothesize that both graduations and attritions are dependent upon receipt of aid in previous years.* For associate programs, usually of two-years duration, we include aid variables for years t-1 and t-2. For the three-year diploma programs, we also include aid in year t-3. Although baccalaureate programs are generally of four-year duration, preliminary testing of our models indicated that the addition of aid in t-4 to the model had little effect on statistical results. We therefore did not include any aid variables lagged four years in the models for baccalaureate programs.**

As has often been the case in other research, we found that estimation of models containing lagged variables (receipt/nonreceipt of aid in previous years) to be very difficult. High correlations between receipt/nonreceipt of aid in consecutive years cause estimated regression coefficients for aid variables to be unstable. The usual correction for this problem is a manipulation of the algebraic form of the equation to impose stability on estimated coefficients. In a rough fashion, this is the correction we use. The aid variables in equations for attritions and graduates ($\overline{AID}$) are the sum of lagged values of the dummy variables (AID) used in the equations for admissions:

Associate Programs: $\overline{AID}_t = AID_{t-1} + AID_{t-2}$

---

* Because of the timing of awards within fiscal years (toward the end of the period), funds awarded in year t are likely to be actually spent by schools in the t/t+1 school year. As a result, awards in year t affect admissions in year t but not graduations or attritions for year t.

**Those readers familiar with estimation of models containing lagged variables will recall that the longer the lags reflected in the model, the more initial years of data that cannot be used to estimate parameters. To avoid loss of an additional years of data, we limited the lag in the baccalaureate model to three years.

APPENDIX A

MISCELLANEOUS STATISTICAL TABLES

Note: Tables A-1, A-2 and A-3 indicate means and standard deviations for variables before school-specific means have been subtracted. Transformed data (school-specific means subtracted) were used to derive the fixed-effects estimates shown in Tables 4 through 6 in the text.

Table A-1

MEANS ($\bar{X}$) AND STANDARD DEVIATIONS (s) FOR VARIABLES USED IN REGRESSION MODELS FOR DIPLOMA PROGRAMS

EXPLANATORY VARIABLES	SMALL PROGRAMS		MEDIUM PROGRAMS		LARGE PROGRAMS	
	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
NUMBER OF GRADUATIONS	22.7287	8.6570	34.7063	11.1906	61.0072	23.9631
NUMBER OF ADMISSIONS	32.0780	10.1537	49.6331	12.6999	86.7798	31.5646
NUMBER OF ATTRITIONS	8.5993	8.8308	13.3719	10.8171	23.4871	22.3663
FINANCIAL SUPPORT: PUBLIC	0.2686	0.4434	0.1127	0.3163	0.1296	0.3359
CONTROL: HOSPITAL	0.9876	0.1108	0.9737	0.1601	0.9610	0.1936
CONTROL: UNIVERSITY	0.0000	0.0000	0.0000	0.0000	0.0036	0.0599
CONTROL: JUNIOR COLLEGE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HOSPITAL BEDS PER CAPITA	8.0783	1.4209	7.8276	1.3444	7.7403	1.4770
HOSPITAL DAYS PER CAPITA	2.3711	0.4784	2.2688	0.4498	2.2252	0.4884
SALARIES: PUBLIC SCHOOL TEACHERS	11.4585	2.6435	12.1225	2.8290	12.0462	2.8225
POPULATION	8.6397	5.2469	8.3372	5.1341	8.2087	5.0183
POPULATION DENSITY	2.9539	5.6261	3.1669	4.1206	3.3034	9.6671
PHYSICIANS PER CAPITA	1.3423	0.3409	1.3553	0.3134	1.3563	0.3637
NURSING HOME BEDS PER CAPITA	4.6061	1.6310	5.2899	2.0186	5.5874	2.0663
HIGH SCHOOL GRADUATES	1.0904	0.6147	1.0735	0.6325	1.0733	0.6200
RN'S PER CAPITA	4.3208	1.0853	4.5012	1.0921	4.4028	1.1737
LPN'S PER CAPITA	1.7646	0.4192	1.8025	0.4877	1.8972	0.4964
YEAR 1969	0.1560	0.3630	0.1121	0.3156	0.1032	0.3043
YEAR 1970	0.1418	0.3490	0.1090	0.3117	0.1044	0.3058
YEAR 1971	0.1223	0.3278	0.1102	0.3132	0.1038	0.3051
YEAR 1972	0.1090	0.3118	0.1021	0.3028	0.1008	0.3011
YEAR 1973	0.0922	0.2894	0.0964	0.2953	0.0966	0.2955
YEAR 1974	0.0789	0.2697	0.0870	0.2820	0.0918	0.2888
YEAR 1975	0.0709	0.2568	0.0833	0.2764	0.0870	0.2819
YEAR 1976	0.0647	0.2461	0.0789	0.2697	0.0828	0.2756
YEAR 1977	0.0585	0.2348	0.0776	0.2677	0.0816	0.2738
YEAR 1978	0.0559	0.2297	0.0726	0.2596	0.0762	0.2654
YEAR 1979	0.0496	0.2173	0.0708	0.2565	0.0720	0.2585
For Admission Equations:						
FORMULA GRANTS 1965-69	0.0567	0.2314	0.0689	0.2533	0.0744	0.2625
CAPITATION 1972-75	0.0887	0.2844	0.1622	0.3687	0.2496	0.4329
CAPITATION 1976-79	0.0594	0.2365	0.1359	0.3428	0.1818	0.3858
LOANS/SCHOLARSHIPS 1965-69	0.0585	0.2348	0.0601	0.2378	0.0732	0.2605
LOANS/SCHOLARSHIPS 1970-71	0.1073	0.3096	0.1296	0.3360	0.1500	0.3571
LOANS/SCHOLARSHIPS 1972-75	0.1418	0.3490	0.2379	0.4260	0.2837	0.4509
LOANS/SCHOLARSHIPS 1976-79	0.1099	0.3129	0.2110	0.4082	0.2537	0.4353
CONSTRUCTION 1965-79	0.0301	0.1711	0.1033	0.3045	0.1152	0.3193
For Attrition/Graduation Equations:						
FORMULA GRANTS 1965-69	0.3094	0.7647	0.3882	0.8427	0.4397	0.8944
CAPITATION 1972-75	0.2234	0.5696	0.4615	0.8328	0.7193	1.0056
CAPITATION 1976-79	0.1356	0.5196	0.3100	0.7922	0.4253	0.9007
LOANS/SCHOLARSHIPS 1965-69	0.3174	0.7894	0.3519	0.8081	0.4145	0.8760
LOANS/SCHOLARSHIPS 1970-71	0.2881	0.6244	0.3795	0.7000	0.4535	0.7428
LOANS/SCHOLARSHIPS 1972-75	0.3803	0.8124	0.6775	1.0269	0.8194	1.0771
LOANS/SCHOLARSHIPS 1976-79	0.2349	0.7228	0.4721	0.9727	0.5609	1.0471
CONSTRUCTION 1965-79	0.0842	0.4867	0.3037	0.8996	0.3383	0.9442

Table A-1

MEANS ($\bar{X}$) AND STANDARD DEVIATIONS (s) FOR VARIABLES USED IN REGRESSION MODELS FOR DIPLOMA PROGRAMS (CONTINUED)

	SMALL PROGRAMS		MEDIUM PROGRAMS		LARGE PROGRAMS	
STATES	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
ALABAMA	0.0301	0.1711	0.0144	0.1192	0.0084	0.0913
ARIZONA	0.0000	0.0000	0.0000	0.0000	0.0006	0.0245
ARKANSAS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CALIFORNIA	0.0000	0.0000	0.0207	0.1423	0.0168	0.1285
COLORADO	0.0098	0.0983	0.0025	0.0500	0.0066	0.0810
CONNECTICUT	0.0213	0.1444	0.0244	0.1544	0.0228	0.1493
DELAWARE	0.0186	0.1352	0.0050	0.0706	0.0000	0.0000
DISTRICT OF COLUMBIA	0.0018	0.0421	0.0006	0.0250	0.0066	0.0810
FLORIDA	0.0000	0.0000	0.0019	0.0433	0.0078	0.0880
GEORGIA	0.0124	0.1108	0.0100	0.0996	0.0198	0.1393
IDAHO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ILLINOIS	0.0550	0.2280	0.1221	0.3275	0.0570	0.2319
INDIANA	0.0027	0.0515	0.0200	0.1402	0.0276	0.1639
IOWA	0.0239	0.1529	0.0200	0.1402	0.0372	0.1893
KANSAS	0.0381	0.1916	0.0069	0.0827	0.0156	0.1239
KENTUCKY	0.0133	0.1146	0.0038	0.0612	0.0066	0.0810
LOUISIANA	0.0071	0.0840	0.0069	0.0827	0.0132	0.1142
MAINE	0.0000	0.0000	0.0238	0.1525	0.0000	0.0000
MARYLAND	0.0195	0.1383	0.0100	0.0996	0.0144	0.1192
MASSACHUSETTS	0.0390	0.1937	0.0758	0.2647	0.0780	0.2682
MICHIGAN	0.0124	0.1108	0.0207	0.1423	0.0444	0.2060
MINNESOTA	0.0053	0.0728	0.0144	0.1192	0.0270	0.1621
MISSISSIPPI	0.0098	0.0983	0.0056	0.0749	0.0000	0.0000
MISSOURI	0.0124	0.1108	0.0069	0.0827	0.0678	0.2515
MONTANA	0.0018	0.0421	0.0044	0.0661	0.0000	0.0000
NEBRASKA	0.0000	0.0000	0.0219	0.1465	0.0228	0.1493
NEVADA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NEW HAMPSHIRE	0.0230	0.1501	0.0125	0.1112	0.0048	0.0691
NEW JERSEY	0.0559	0.2297	0.0764	0.2657	0.0276	0.1639
NEW MEXICO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NEW YORK	0.1339	0.3407	0.0877	0.2829	0.0954	0.2938
NORTH CAROLINA	0.0443	0.2059	0.0125	0.1112	0.0168	0.1285
NORTH DAKOTA	0.0009	0.0298	0.0125	0.1112	0.0066	0.0810
OHIO	0.0363	0.1872	0.0745	0.2627	0.1218	0.3271
OKLAHOMA	0.0000	0.0000	0.0019	0.0433	0.0078	0.0880
OREGON	0.0000	0.0000	0.0000	0.0000	0.0090	0.0945
PENNSYLVANIA	0.2296	0.4208	0.1472	0.3544	0.1098	0.3127
RHODE ISLAND	0.0000	0.0000	0.0138	0.1166	0.0018	0.0424
SOUTH CAROLINA	0.0098	0.0983	0.0000	0.0000	0.0018	0.0424
SOUTH DAKOTA	0.0071	0.0840	0.0069	0.0827	0.0066	0.0810
TENNESSEE	0.0000	0.0000	0.0213	0.1444	0.0258	0.1586
TEXAS	0.0248	0.1557	0.0038	0.0612	0.0198	0.1393
UTAH	0.0000	0.0000	0.0013	0.0354	0.0000	0.0000
VERMONT	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
VIRGINIA	0.0878	0.2831	0.0401	0.1962	0.0066	0.0810
WASHINGTON	0.0000	0.0000	0.0044	0.0661	0.0042	0.0647
WEST VIRGINIA	0.0027	0.0515	0.0100	0.0996	0.0066	0.0810
WISCONSIN	0.0098	0.0983	0.0307	0.1725	0.0264	0.1604
WYOMING	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table A-2

MEANS ($\bar{X}$) AND STANDARD DEVIATIONS (s) FOR VARIABLES USED IN REGRESSION MODELS FOR ASSOCIATE PROGRAMS

	SMALL PROGRAMS		MEDIUM PROGRAMS		LARGE PROGRAMS	
EXPLANATORY VARIABLES	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
NUMBER OF GRADUATIONS	27.3909	10.7564	44.4923	16.1538	80.8391	46.4961
NUMBER OF ADMISSIONS	41.7811	13.0037	68.9737	19.8515	127.0253	69.9629
NUMBER OF ATTRITIONS	12.0549	11.2419	19.2327	18.3179	34.7402	53.8795
FINANCIAL SUPPORT: PUBLIC	0.9100	0.2863	0.9071	0.2905	0.8903	0.3126
CONTROL: HOSPITAL	0.0016	0.0399	0.0026	0.0506	0.0011	0.0335
CONTROL: UNIVERSITY	0.2046	0.4036	0.2462	0.4309	0.2267	0.4188
CONTROL: JUNIOR COLLEGE	0.7906	0.4070	0.7506	0.4328	0.7722	0.4195
HOSPITAL BEDS PER CAPITA	6.6104	1.2361	6.8132	1.2781	7.0957	1.4820
HOSPITAL DAYS PER CAPITA	1.8207	0.4107	1.9102	0.4433	2.0327	0.5181
SALARIES: PUBLIC SCHOOL TEACHERS	12.8199	3.0356	12.8211	3.1434	13.0478	3.1014
POPULATION	6.8883	6.2010	8.6951	6.8668	9.5938	6.2969
POPULATION DENSITY	1.3873	1.7030	1.8502	2.0616	2.8142	7.9428
PHYSICIANS PER CAPITA	1.2884	0.3056	1.3616	0.3492	1.4150	0.3707
NURSING HOME BEDS PER CAPITA	4.9280	2.0942	5.2993	1.8771	5.0358	1.8233
HIGH SCHOOL GRADUATES	0.9178	0.8108	1.1444	0.8858	1.2342	0.7867
RN'S PER CAPITA	4.0080	1.1203	4.0926	1.2556	4.1520	1.1351
LPN'S PER CAPITA	1.8778	0.5123	1.8812	0.5512	1.8245	0.5399
YEAR 1968	0.0191	0.1370	0.0256	0.1581	0.0371	0.1891
YEAR 1969	0.0247	0.1552	0.0314	0.1745	0.0394	0.1945
YEAR 1970	0.0374	0.1899	0.0487	0.2153	0.0517	0.2216
YEAR 1971	0.0486	0.2150	0.0692	0.2539	0.0799	0.2712
YEAR 1972	0.0645	0.2457	0.0750	0.2635	0.0832	0.2763
YEAR 1973	0.0756	0.2645	0.0846	0.2784	0.0911	0.2879
YEAR 1974	0.0884	0.2840	0.0936	0.2914	0.0956	0.2941
YEAR 1975	0.1011	0.3016	0.1026	0.3035	0.0956	0.2941
YEAR 1976	0.1146	0.3187	0.1122	0.3157	0.1018	0.3025
YEAR 1977	0.1338	0.3405	0.1141	0.3180	0.1069	0.3090
YEAR 1978	0.1481	0.3553	0.1205	0.3257	0.1097	0.3126
YEAR 1979	0.1441	0.3513	0.1224	0.3279	0.1080	0.3105
For Admission Equations:						
CAPITATION 1972-75	0.1433	0.3505	0.2218	0.4156	0.2413	0.4280
CAPITATION 1976-79	0.3121	0.4635	0.2821	0.4501	0.2773	0.4478
LOANS/SCHOLARSHIPS 1965-69	0.0072	0.0844	0.0173	0.1305	0.0382	0.1918
LOANS/SCHOLARSHIPS 1970-71	0.0438	0.2047	0.0769	0.2666	0.1001	0.3002
LOANS/SCHOLARSHIPS 1972-75	0.2197	0.4142	0.2481	0.4320	0.2801	0.4492
LOANS/SCHOLARSHIPS 1976-79	0.0375	0.4794	0.3135	0.4640	0.3133	0.4640
CONSTRUCTION 1965-79	0.0358	0.1859	0.0955	0.2940	0.1569	0.3638
For Attrition/Graduation Equations:						
CAPITATION 1972-75	0.3153	0.6179	0.4647	0.7323	0.4955	0.7556
CAPITATION 1976-79	0.5518	0.8291	0.5006	0.7937	0.4910	0.7876
LOANS/SCHOLARSHIPS 1965-69	0.0167	0.1613	0.0417	0.2611	0.0911	0.3805
LOANS/SCHOLARSHIPS 1970-71	0.1027	0.3678	0.1744	0.4836	0.2289	0.5388
LOANS/SCHOLARSHIPS 1972-75	0.4674	0.7483	0.5212	0.7712	0.5726	0.7978
LOANS/SCHOLARSHIPS 1976-79	0.6298	0.8759	0.5532	0.8368	0.5495	0.8334
CONSTRUCTION 1965-79	0.0677	0.3562	0.1859	0.5765	0.3026	0.7090

Table A-2

MEANS ($\bar{X}$) AND STANDARD DEVIATIONS (s) FOR VARIABLES USED IN REGRESSION MODELS FOR ASSOCIATE PROGRAMS
(CONTINUED)

	SMALL PROGRAMS		MEDIUM PROGRAMS		LARGE PROGRAMS	
STATES	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
ALABAMA	0.0119	0.1087	0.0186	0.1351	0.0141	0.1178
ARIZONA	0.0406	0.1975	0.0064	0.0798	0.0152	0.1223
ARKANSAS	0.0056	0.0745	0.0205	0.1418	0.0141	0.1178
CALIFORNIA	0.1234	0.3290	0.1564	0.3634	0.0939	0.2918
COLORADO	0.0056	0.0745	0.0237	0.1522	0.0045	0.0669
CONNECTICUT	0.0000	0.0000	0.0109	0.1039	0.0112	0.1055
DELAWARE	0.0096	0.0973	0.0026	0.0506	0.0000	0.0000
DISTRICT OF COLUMBIA	0.0000	0.0000	0.0000	0.0000	0.0045	0.0669
FLORIDA	0.0414	0.1993	0.0212	0.1439	0.0461	0.2098
GEORGIA	0.0358	0.1859	0.0462	0.2099	0.0112	0.1055
IDAHO	0.0175	0.1312	0.0077	0.0874	0.0056	0.0748
ILLINOIS	0.0326	0.1778	0.0417	0.1999	0.0748	0.2631
INDIANA	0.0000	0.0000	0.0269	0.1619	0.0427	0.2023
IOWA	0.0406	0.1975	0.0167	0.1281	0.0000	0.0000
KANSAS	0.0334	0.1799	0.0090	0.0943	0.0000	0.0000
KENTUCKY	0.0311	0.1735	0.0269	0.1619	0.0281	0.1654
LOUISIANA	0.0056	0.0745	0.0000	0.0000	0.0141	0.1178
MAINE	0.0000	0.0000	0.0077	0.0874	0.0028	0.0530
MARYLAND	0.0143	0.1189	0.0147	0.1206	0.0337	0.1806
MASSACHUSETTS	0.0446	0.2065	0.0500	0.2180	0.0146	0.1201
MICHIGAN	0.0263	0.1600	0.0372	0.1893	0.0495	0.2170
MINNESOTA	0.0111	0.1050	0.0071	0.0837	0.0253	0.1571
MISSISSIPPI	0.0470	0.2117	0.0327	0.1779	0.0000	0.0000
MISSOURI	0.0390	0.1937	0.0109	0.1039	0.0242	0.1537
MONTANA	0.0056	0.0745	0.0071	0.0837	0.0000	0.0000
NEBRASKA	0.0000	0.0000	0.0000	0.0000	0.0056	0.0748
NEVADA	0.0024	0.0488	0.0000	0.0000	0.0034	0.0580
NEW HAMPSHIRE	0.0000	0.0000	0.0000	0.0000	0.0039	0.0626
NEW JERSEY	0.0088	0.0932	0.0205	0.1418	0.0422	0.2011
NEW MEXICO	0.0223	0.1477	0.0000	0.0000	0.0051	0.0710
NEW YORK	0.0088	0.0932	0.0660	0.2484	0.1445	0.3517
NORTH CAROLINA	0.1011	0.3016	0.0205	0.1418	0.0096	0.0973
NORTH DAKOTA	0.0064	0.0796	0.0000	0.0000	0.0045	0.0669
OHIO	0.0143	0.1189	0.0436	0.2042	0.0523	0.2227
OKLAHOMA	0.0207	0.1424	0.0147	0.1206	0.0079	0.0884
OREGON	0.0175	0.1312	0.0179	0.1328	0.0062	0.0784
PENNSYLVANIA	0.0191	0.1370	0.0179	0.1328	0.0366	0.1877
RHODE ISLAND	0.0000	0.0000	0.0000	0.0000	0.0090	0.0945
SOUTH CAROLINA	0.0231	0.1502	0.0122	0.1097	0.0129	0.1130
SOUTH DAKOTA	0.0032	0.0564	0.0058	0.0758	0.0051	0.0710
TENNESSEE	0.0040	0.0630	0.0365	0.1877	0.0242	0.1537
TEXAS	0.0191	0.1370	0.0372	0.1893	0.0467	0.2110
UTAH	0.0000	0.0000	0.0045	0.0669	0.0028	0.0530
VERMONT	0.0096	0.0973	0.0128	0.1125	0.0000	0.0000
VIRGINIA	0.0533	0.2248	0.0115	0.1068	0.0135	0.1154
WASHINGTON	0.0247	0.1552	0.0276	0.1638	0.0202	0.1409
WEST VIRGINIA	0.1197	0.1087	0.0327	0.1779	0.0067	0.0819
WISCONSIN	0.0008	0.0282	0.0154	0.1231	0.0067	0.0819
WYOMING	0.0064	0.0796	0.0000	0.0000	0.0000	0.0000

Table A-3

MEANS ($\bar{X}$) AND STANDARD DEVIATIONS (s) FOR VARIABLES USED IN REGRESSION MODELS FOR BACCALAUREATE PROGRAMS

	SMALL PROGRAMS		MEDIUM PROGRAMS		LARGE PROGRAMS	
EXPLANATORY VARIABLES	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
NUMBER OF GRADUATIONS	38.6638	19.1026	62.9807	35.2699	111.1792	72.6288
NUMBER OF ADMISSIONS	55.1717	21.5189	91.9843	36.6769	164.4427	95.1380
NUMBER OF ATTRITIONS	8.7425	24.6087	13.5761	42.3471	22.3490	94.6729
FINANCIAL SUPPORT: PUBLIC	0.3548	0.4788	0.5374	0.4989	0.6115	0.4877
CONTROL: HOSPITAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CONTROL: UNIVERSITY	0.9943	0.0755	0.9819	0.1335	0.9854	0.1199
CONTROL: JUNIOR COLLEGE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HOSPITAL BEDS PER CAPITA	7.4522	1.7153	7.1708	1.8064	7.3519	1.6370
HOSPITAL DAYS PER CAPITA	2.0766	0.5590	2.0230	0.5974	2.1085	0.5526
SALARIES: PUBLIC SCHOOL TEACHERS	12.5601	3.1622	12.7566	3.0610	12.7981	3.1224
POPULATION	7.3759	6.5218	8.1511	6.4678	8.0619	5.8158
POPULATION DENSITY	3.3635	14.5870	4.1221	16.4419	3.8182	12.6118
PHYSICIANS PER CAPITA	1.3414	0.4514	1.4019	0.4537	1.3871	0.4135
NURSING HOME BEDS PER CAPITA	5.7326	2.4164	5.2687	2.1595	5.2644	1.9029
HIGH SCHOOL GRADUATES	0.9688	0.8157	1.0702	0.8242	1.0548	0.7301
RN'S PER CAPITA	4.2137	1.2758	4.3154	1.2511	4.3369	1.3050
LPN'S PER CAPITA	1.9376	0.5937	1.8927	0.5328	1.9162	0.5195
YEAR 1969	0.0629	0.2430	0.0580	0.2338	0.0687	0.2532
YEAR 1970	0.0658	0.2481	0.0628	0.2428	0.0719	0.2584
YEAR 1971	0.0701	0.2555	0.0761	0.2653	0.0781	0.2685
YEAR 1972	0.0730	0.2603	0.0797	0.2710	0.0885	0.2842
YEAR 1973	0.0830	0.2760	0.0918	0.2889	0.0927	0.2902
YEAR 1974	0.0930	0.2906	0.0966	0.2956	0.0906	0.2872
YEAR 1975	0.0987	0.2985	0.0990	0.2989	0.0990	0.2988
YEAR 1976	0.1016	0.3023	0.1027	0.3037	0.0990	0.2988
YEAR 1977	0.1102	0.3133	0.1087	0.3114	0.1031	0.3043
YEAR 1978	0.1243	0.3303	0.1123	0.3159	0.1042	0.3056
YEAR 1979	0.1173	0.3220	0.1123	0.3159	0.1042	0.3056
For Admission Equations:						
CAPITATION 1972-75	0.2318	0.4223	0.2645	0.4413	0.2865	0.4523
CAPITATION 1976-79	0.3176	0.4659	0.3140	0.4644	0.2885	0.4533
LOANS/SCHOLARSHIPS 1965-69	0.0443	0.2060	0.0483	0.2145	0.0573	0.2325
LOANS/SCHOLARSHIPS 1970-71	0.1159	0.3203	0.1220	0.3275	0.1240	0.3297
LOANS/SCHOLARSHIPS 1972-75	0.2847	0.4516	0.2693	0.4439	0.2917	0.4548
LOANS/SCHOLARSHIPS 1976-79	0.3562	0.4792	0.3285	0.4700	0.3031	0.4598
CONSTRUCTION 1965-79	0.2074	0.4397	0.1957	0.4235	0.3490	0.5575
For Attrition/Graduation Equations:						
CAPITATION 1972-75	0.7768	1.0714	0.8357	1.0522	0.8719	1.0909
CAPITATION 1976-79	0.7439	1.1350	0.7114	1.1193	0.6635	1.0808
LOANS/SCHOLARSHIPS 1965-69	0.2561	0.7012	0.2862	0.7484	0.3365	0.8094
LOANS/SCHOLARSHIPS 1970-71	0.3834	0.7053	0.4203	0.7504	0.4156	0.7301
LOANS/SCHOLARSHIPS 1972-75	0.9227	1.1214	0.8563	1.0581	0.8833	1.1012
LOANS/SCHOLARSHIPS 1976-79	0.8126	1.1924	0.7476	1.1482	0.6885	1.1111
CONSTRUCTION 1965-79	0.5637	1.2358	0.5592	1.2255	0.9698	1.5767

Table A-3

MEANS ($\bar{X}$) AND STANDARD DEVIATIONS (s) FOR VARIABLES USED IN REGRESSION MODELS FOR BACCALAUREATE PROGRAMS (CONTINUED)

	SMALL PROGRAMS		MEDIUM PROGRAMS		LARGE PROGRAMS	
STATES	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
ALABAMA	0.0057	0.0755	0.0278	0.1644	0.0198	0.1394
ARIZONA	0.0000	0.0000	0.0000	0.0000	0.0208	0.1429
ARKANSAS	0.0172	0.1300	0.0000	0.0000	0.0094	0.0964
CALIFORNIA	0.0773	0.2672	0.0954	0.2940	0.0344	0.1823
COLORADO	0.0000	0.0000	0.0254	0.1573	0.0083	0.0910
CONNECTICUT	0.0100	0.0996	0.0181	0.1335	0.0229	0.1497
DELAWARE	0.0000	0.0000	0.0000	0.0000	0.0115	0.1065
DISTRICT OF COLUMBIA	0.0157	0.1245	0.0205	0.1419	0.0115	0.1065
FLORIDA	0.0157	0.1245	0.0580	0.2338	0.0000	0.0000
GEORGIA	0.0386	0.1928	0.0036	0.0601	0.0115	0.1065
IDAHO	0.0157	0.1245	0.0000	0.0000	0.0000	0.0000
ILLINOIS	0.0429	0.2028	0.0266	0.1609	0.0469	0.2115
INDIANA	0.0300	0.1708	0.0266	0.1609	0.0313	0.1741
IOWA	0.0415	0.1996	0.0000	0.0000	0.0115	0.1065
KANSAS	0.0329	0.2241	0.0085	0.0916	0.0000	0.0000
KENTUCKY	0.0129	0.1128	0.0217	0.1459	0.0115	0.1065
LOUISIANA	0.0129	0.1128	0.0302	0.1712	0.0323	0.1769
MAINE	0.0000	0.0000	0.0012	0.0348	0.0115	0.1065
MARYLAND	0.0258	0.1585	0.0024	0.0491	0.0052	0.0720
MASSACHUSETTS	0.0172	0.1300	0.0193	0.1377	0.0479	0.2137
MICHIGAN	0.0215	0.1450	0.0229	0.1498	0.0479	0.2137
MINNESOTA	0.0672	0.2506	0.0217	0.1459	0.0156	0.1241
MISSISSIPPI	0.0329	0.1785	0.0000	0.0000	0.0104	0.1016
MISSOURI	0.0329	0.1785	0.0000	0.0000	0.0313	0.1741
MONTANA	0.0029	0.0535	0.0000	0.0000	0.0104	0.1016
NEBRASKA	0.0143	0.1188	0.0181	0.1335	0.0000	0.0000
NEVADA	0.0114	0.1064	0.0000	0.0000	0.0000	0.0000
NEW HAMPSHIRE	0.0000	0.0000	0.0109	0.1038	0.1004	0.1016
NEW JERSEY	0.0100	0.0996	0.0036	0.0601	0.0469	0.2115
NEW MEXICO	0.0000	0.0000	0.0000	0.0000	0.0083	0.0910
NEW YORK	0.1016	0.3023	0.0894	0.2855	0.1281	0.3344
NORTH CAROLINA	0.0343	0.1822	0.0531	0.2244	0.0229	0.1497
NORTH DAKOTA	0.0401	0.1962	0.0109	0.1038	0.0000	0.0000
OHIO	0.0000	0.0000	0.0640	0.2449	0.0334	0.1849
OKLAHOMA	0.0286	0.1668	0.0181	0.1335	0.0000	0.0000
OREGON	0.0000	0.0000	0.0097	0.0979	0.0094	0.0964
PENNSYLVANIA	0.0529	0.2241	0.0531	0.2244	0.0625	0.2422
RHODE ISLAND	0.0000	0.0000	0.0109	0.1038	0.0167	0.1281
SOUTH CAROLINA	0.0000	0.0000	0.0121	0.1093	0.0187	0.1357
SOUTH DAKOTA	0.0143	0.1188	0.0133	0.1146	0.0115	0.1065
TENNESSEE	0.0215	0.1450	0.0024	0.0491	0.0281	0.1654
TEXAS	0.0300	0.1708	0.0266	0.1609	0.0542	0.2265
UTAH	0.0100	0.0996	0.0133	0.1146	0.0000	0.0000
VERMONT	0.0000	0.0000	0.0133	0.1146	0.0000	0.0000
VIRGINIA	0.0000	0.0000	0.0531	0.2244	0.0146	0.1199
WASHINGTON	0.0129	0.1128	0.0302	0.1712	0.0156	0.1241
WEST VIRGINIA	0.0286	0.1668	0.0133	0.1146	0.0000	0.0000
WISCONSIN	0.0000	0.0000	0.0374	0.1900	0.0531	0.2244
WYOMING	0.0000	0.0000	0.0133	0.1146	0.0000	0.0000

Table A-4

FREQUENCY OF YEAR-TO-YEAR DECREASES IN ADMISSIONS BY TYPE OF PROGRAM BY RECEIPT/NONRECEIPT OF FORMULA/CAPITATION GRANTS BY YEAR
(Number of Programs and Percentage of Programs*)

	DIPLOMA PROGRAMS				ASSOCIATE PROGRAMS				BACCALAUREATE PROGRAMS			
	Programs Not Receiving Formula/ Capitation Grants		Programs Receiving Formula/ Capitation Grants		Programs Not Receiving Formula/ Capitation Grants		Programs Receiving Formula/ Capitation Grants		Programs Not Receiving Formula/ Capitation Grants		Programs Receiving Formula/ Capitation Grants	
Year	Adm < 0	Adm ≥ 0	Adm < 0	Adm ≥ 0	Adm < 0	Adm ≥ 0	Adm < 0	Adm ≥ 0	Adm < 0	Adm ≥ 0	Adm < 0	Adm ≥ 0
1968	--	--	--	--	45 (35)	85 (65)	na	na	--	--	--	--
1969	100 (44)	129 (56)	121 (41)	177 (59)	49 (33)	101 (67)	na	na	62 (39)	96 (61)	na	na
1970	210 (41)	298 (59)	na	na	53 (25)	162 (75)	na	na	54 (32)	113 (68)	na	na
1971	107 (41)	380 (59)	na	na	64 (21)	247 (79)	na	na	40 (21)	147 (79)	na	na
1972	82 (41)	119 (59)	60 (24)	193 (76)	40 (27)	108 (73)	146 (23)	152 (77)	21 (48)	23 (52)	39 (25)	119 (75)
1973	126 (57)	94 (43)	104 (52)	95 (48)	61 (38)	100 (62)	71 (31)	157 (69)	31 (52)	29 (48)	57 (35)	106 (65)
1974	101 (47)	114 (53)	71 (43)	95 57)	59 (33)	121 (67)	92 (37)	155 (63)	21 (30)	48 (70)	57 (35)	106 (65)
1975	82 (41)	119 (59)	63 (40)	94 (60)	65 (37)	110 (63)	100 (35)	182 (65)	28 (38)	46 (62)	78 (45)	94 (55)
1976	95 (53)	83 (47)	48 (30)	111 (70)	78 (41)	114 (59)	101 (33)	207 (67)	35 (48)	38 (52)	66 (37)	112 (63)
1977	101 (61)	64 (39)	72 (45)	89 (55)	98 (48)	106 (52)	135 (41)	197 (59)	27 (37)	46 (63)	69 (36)	124 (64)
1978	92 (61)	58 (39)	79 (51)	77 (49)	111 (52)	104 (48)	150 (42)	204 (58)	41 (55)	33 (45)	113 (55)	93 (45)
1979	138 (78)	40 (22)	63 (57)	48 (43)	138 (59)	95 (41)	198 (60)	133 (40)	58 (62)	35 (38)	107 (59)	75 (41)

*Numbers in parentheses indicate percentage distribution of schools between each pair of columns.

na: Not applicable, no formula/capitation grants available.

Table A-5

REGRESSION RESULTS: NUMBER OF NURSING SCHOOL ADMISSIONS, BY TYPE AND SIZE OF PROGRAM
Test for Differential Effectiveness of NTA Funding Across Areas with Different RN/Population Ratios

	DIPLOMA PROGRAMS			ASSOCIATE PROGRAMS			BACCALAUREATE PROGRAMS		
EXPLANATORY VARIABLES	Small	Medium	Large	Small	Medium	Large	Small	Medium	Large
HOSPITAL BEDS PER CAPITA	-1.94 (-1.00)	5.59 (2.61)	-16.67 (-4.21)	3.19 (1.27)	-6.30 (-1.62)	27.70 (3.04)	0.67 (0.12)	5.55 (0.63)	-18.96 (-1.17)
HOSPITAL DAYS PER CAPITA	5.46 (0.93)	-13.66 (-2.10)	47.23 (3.65)	-4.47 (-0.58)	7.47 (0.60)	-88.06 (-2.99)	-29.56 (-1.64)	-19.41 (-0.71)	51.10 (0.98)
SALARIES: PUBLIC SCHOOL TEACHERS	-0.11 (-0.18)	-0.76 (-1.33)	-2.09 (-1.76)	-2.05 (-4.03)	-3.36 (-3.77)	-5.41 (-2.64)	1.89 (1.10)	-1.44 (-0.62)	-10.83 (-3.05)
POPULATION	6.26 (2.61)	1.18 (0.60)	6.31 (1.91)	-2.83 (-2.33)	-6.41 (-3.52)	-0.79 (-0.19)	-6.57 (-2.00)	-13.37 (-2.71)	-23.01 (-2.36)
POPULATION DENSITY	-12.64 (-2.71)	-3.34 (-0.47)	3.81 (3.49)	9.25 (0.94)	40.56 (2.27)	-4.50 (-1.36)	0.78 (0.63)	-1.04 (-0.52)	-6.03 (-1.66)
PHYSICIANS PER CAPITA	-12.86 (-1.39)	5.10 (0.58)	4.07 (0.28)	-20.49 (-2.06)	-8.36 (-0.48)	29.04 (1.03)	-8.66 (-0.46)	-13.19 (-0.41)	-164.30 (-3.23)
NURSING HOME BEDS PER CAPITA	0.99 (1.65)	-0.21 (-0.59)	-1.26 (-1.96)	0.05 (0.09)	-2.33 (-2.98)	1.45 (0.75)	0.17 (0.17)	3.97 (2.37)	-0.43 (-0.14)
HIGH SCHOOL GRADUATES	-11.86 (-2.48)	2.07 (0.31)	-14.60 (-2.42)	-1.54 (-0.46)	3.14 (0.76)	-37.14 (-3.83)	15.40 (2.19)	-6.99 (-0.60)	-15.57 (-0.84)
RN'S PER CAPITA	0.66 (0.47)	-1.84 (-1.47)	-2.20 (-0.88)	1.65 (1.23)	-4.36 (-1.88)	-4.34 (-0.79)	-6.28 (-1.56)	5.85 (1.19)	2.38 (0.30)
LPN'S PER CAPITA	1.18 (0.76)	0.63 (0.45)	5.40 (1.19)	-3.32 (-1.63)	1.94 (0.60)	-13.94 (-1.71)	6.74 (1.51)	-14.61 (-2.01)	-23.92 (-2.06)
YEAR 1969	—	—	—	4.90 (2.19)	8.16 (2.50)	6.62 (0.93)	—	—	—
YEAR 1970	0.84 (0.71)	3.38 (2.23)	-1.16 (-0.36)	10.49 (4.41)	10.34 (2.67)	24.04 (2.48)	4.12 (0.70)	4.70 (0.38)	22.73 (1.20)
YEAR 1971	6.38 (3.94)	1.00 (5.43)	7.78 (2.09)	17.89 (6.80)	21.13 (4.76)	50.06 (4.50)	12.99 (2.04)	22.35 (1.76)	65.14 (3.28)
YEAR 1972	7.65 (3.50)	13.59 (5.97)	12.58 (2.89)	24.90 (8.61)	28.89 (5.67)	68.67 (5.61)	9.78 (1.50)	28.73 (2.31)	115.82 (5.48)
YEAR 1973	6.98 (2.67)	12.31 (4.64)	11.69 (2.34)	28.13 (8.68)	35.10 (6.12)	74.92 (5.59)	9.68 (1.37)	30.70 (2.31)	130.46 (5.76)
YEAR 1974	7.56 (2.29)	13.56 (4.32)	12.58 (2.17)	31.47 (8.64)	37.63 (5.75)	82.97 (5.49)	11.74 (1.44)	42.49 (2.84)	151.56 (6.05)
YEAR 1975	8.84 (2.22)	15.23 (4.11)	15.64 (2.30)	35.52 (8.57)	43.38 (5.78)	87.45 (5.10)	8.96 (0.96)	43.99 (2.57)	167.19 (5.99)
YEAR 1976	8.24 (1.77)	14.49 (3.39)	11.50 (1.43)	38.62 (8.13)	46.88 (5.42)	76.86 (3.97)	9.22 (0.86)	52.99 (2.75)	180.37 (5.85)
YEAR 1977	7.61 (1.40)	12.20 (2.48)	9.33 (1.00)	41.56 (7.78)	51.22 (5.22)	80.39 (3.71)	8.65 (0.70)	56.63 (2.59)	202.85 (5.86)
YEAR 1978	6.62 (1.06)	11.43 (2.03)	7.04 (0.66)	45.09 (7.58)	53.69 (4.88)	80.76 (3.34)	3.00 (0.21)	54.30 (2.19)	212.51 (5.47)
YEAR 1979	4.76 (0.68)	9.29 (1.47)	4.66 (0.39)	47.37 (7.18)	48.47 (3.95)	65.66 (2.47)	-5.88 (-0.37)	47.58 (1.72)	208.00 (4.86)
FORMULA GRANTS 1965-69	-0.03 (-0.01)	6.04 (2.66)	8.49 (1.78)	—	—	—	—	—	—
CAPITATION 1972-75	3.09 (3.12)	4.68 (4.54)	7.47 (3.66)	-0.72 (-0.39)	4.40 (1.58)	-3.92 (-0.53)	10.10 (2.81)	10.14 (1.15)	7.18 (0.43)
CAPITATION 1976-79	4.66 (3.50)	5.72 (5.06)	15.19 (6.88)	6.42 (3.73)	1.16 (0.35)	14.44 (1.85)	16.09 (4.00)	31.93 (2.48)	-5.29 (-0.33)
LOANS/SCHOLARSHIPS 1965-69	4.78 (2.25)	-0.40 (-0.17)	-7.04 (-1.43)	8.89 (1.84)	-2.37 (-0.47)	-22.99 (-2.50)	12.55 (1.95)	12.41 (0.98)	22.73 (1.13)
LOANS/SCHOLARSHIPS 1970-71	3.61 (2.77)	1.80 (1.34)	-0.09 (-0.03)	3.25 (1.23)	-0.69 (-0.19)	-9.51 (-1.21)	-1.19 (-0.22)	16.41 (1.59)	28.37 (1.84)
LOANS/SCHOLARSHIPS 1972-75	-0.18 (-0.15)	0.85 (0.69)	0.26 (0.09)	3.90 (1.89)	-3.54 (-1.18)	-4.69 (-0.59)	-8.29 (-1.68)	5.44 (0.60)	-8.99 (-0.50)
LOANS/SCHOLARSHIPS 1976-79	-0.89 (-0.62)	2.16 (1.53)	1.74 (0.56)	1.28 (0.61)	4.17 (1.13)	12.20 (1.34)	-17.48 (-3.18)	-18.49 (-1.35)	8.49 (0.46)
CONSTRUCTION 1965-79	-1.57 (-0.39)	3.31 (0.99)	-20.36 (-1.40)	-1.56 (-0.45)	22.91 (3.76)	83.47 (4.36)	-0.67 (-0.12)	-11.30 (-0.70)	-2.66 (-0.19)
D1 x FORMULA GRANTS 1965-69	0.11 (0.03)	-1.93 (-0.47)	-14.78 (-2.10)	—	—	—	—	—	—
D1 x CAPITATION 1972-75	2.40 (1.13)	-1.58 (-0.85)	3.17 (1.02)	2.87 (1.34)	-0.39 (-0.12)	3.26 (0.37)	-12.20 (-2.39)	9.44 (0.67)	-34.32 (-1.31)
D1 x CAPITATION 1976-79	1.53 (0.66)	5.30 (2.54)	-2.37 (-0.70)	-0.17 (-0.08)	4.64 (1.14)	-0.57 (-0.06)	4.93 (0.83)	-27.04 (-1.66)	53.37 (1.82)
D1 x LOANS/SCHOLARSHIPS 1965-69	-2.22 (-0.62)	5.31 (1.24)	18.07 (2.45)	-5.76 (-0.92)	-10.65 (-1.65)	37.58 (3.32)	-13.12 (-1.83)	-4.25 (-0.37)	18.51 (0.95)
D1 x LOANS/SCHOLARSHIPS 1970-71	-0.77 (-0.36)	-0.72 (-0.32)	2.50 (0.65)	-4.22 (-1.47)	-5.00 (-1.36)	9.10 (1.15)	-5.09 (-0.86)	-7.39 (-0.81)	-5.41 (-0.33)
D1 x LOANS/SCHOLARSHIPS 1972-75	-2.14 (-1.06)	1.34 (0.69)	-3.74 (-0.95)	-5.66 (-2.44)	4.06 (1.16)	-6.78 (-0.74)	12.44 (1.96)	-13.11 (-0.93)	47.65 (1.76)
D1 x LOANS/SCHOLARSHIPS 1976-79	-1.60 (-0.69)	-2.47 (-1.06)	-0.99 (-0.24)	-6.07 (-2.59)	-4.56 (-1.03)	-12.61 (-1.15)	0.83 (0.11)	20.53 (1.22)	-49.16 (-1.56)
D1 x CONSTRUCTION 1965-79	—	—	39.80 (2.08)	—	—	-78.20 (-3.80)	6.65 (0.76)	18.07 (0.93)	9.75 (0.54)

D1 = 1 for all programs located in states ranked in bottom half of national distribution of RN/population ratios in 1972;
= 0 for all other programs.

Table A-6

PERCENTAGE OF SCHOOLS RECEIVING NTA FUNDING BY STATE, 1968/69* TO 1979
(Percentage of School Years in Which Funding Was Received)

STATE/AREA**	Percentage of Programs Receiving Loan/ Scholarship Funds	Percentage of Programs Receiving Formula/ Capitation Grants	Number of Programs in Data Set
Arkansas	62	51	85
Alabama	75	58	186
Mississippi	50	48	163
Tennessee	58	38	226
Texas	80	61	327
Louisiana	62	52	138
Oklahoma	87	82	114
Kentucky	62	36	201
New Mexico	89	82	45
Georgia	31	24	241
Utah	75	47	32
South Carolina	42	35	113
Indiana	64	42	272
Missouri	73	57	300
North Carolina	55	38	364
Nevada	35	6	17
Idaho	75	47	55
Michigan	81	50	380
West Virginia	88	65	139
California	69	44	793
Virginia	48	30	341
Florida	62	56	242
Maryland	86	42	188
Ohio	79	47	629
Arizona	72	40	109
Illinois	68	48	688
Kansas	90	61	180
Oregon	74	53	93
Iowa	83	58	238
Wisconsin	83	62	223
Washington	88	71	173
New Jersey	56	42	404
Wyoming	100	84	19
Nebraska	95	46	108
South Dakota	92	70	84
North Dakota	81	59	85
Montana	73	69	39
Maine	78	52	67
Minnesota	70	39	224
Rhode Island	76	44	66
New York	61	42	1089
Colorado	84	58	107
Pennsylvania	66	43	935
Delaware	52	43	56
New Hampshire	71	43	80
Connecticut	62	53	182
Vermont	72	44	43
Massachusetts	59	32	529
District of Columbia	97	59	61
ALL STATES/AREAS	68	47	11473

* 1968-79 for associate programs; 1969-79 for other programs.

**States/areas appear in the order of their RN/population ratios in 1972, Arkansas having the lowest ratio and the District of Columbia having the highest ratio

Table A-7

REGRESSION RESULTS: RECEIPT/NONRECEIPT OF LOAN/SCHOLARSHIP FUNDS AND RECEIPT/NONRECEIPT OF FORMULA/CAPITATION GRANTS BY TYPE OF PROGRAM*
(Ordinary Least Squares Estimates for Dichotomous Dependent Variables)

EXPLANATORY VARIABLES	FUNDS FOR LOANS/SCHOLARSHIPS			FORMULA/CAPITATION GRANTS		
	Diploma	Associate	Baccalaureate	Diploma	Associate	Baccalaureate
INTERCEPT	0.50	0.65	1.14	0.12	0.76	0.94
FINANCIAL SUPPORT: PUBLIC	-0.12 (65.83)	-0.21 (121.07)	-0.23 (296.24)	-0.10 (42.47)	-0.15 (34.55)	-0.21 (147.30)
CONTROL: HOSPITAL	-0.05 (3.66)	-0.57 (46.64)	—	—	-0.19 (4.15)	—
CONTROL: JUNIOR COLLEGE	—	—	—	—	0.08 (17.78)	—
HOSPITAL BEDS PER CAPITA	—	0.05 (61.71)	—	—	—	—
HOSPITAL DAYS PER CAPITA	-0.05 (16.38)	—	—	—	—	—
SALARIES: PUBLIC SCHOOL TEACHERS	—	—	—	—	0.01 (17.24)	—
POPULATION	—	0.00** (6.81)	-0.02 (141.18)	—	—	—
PHYSICIANS PER CAPITA	—	—	-0.06 (10.74)	0.07 (4.06)	—	-0.10 (18.64)
NURSING HOME BEDS PER CAPITA	—	0.01 (6.65)	—	-0.01 (3.53)	—	—
HIGH SCHOOL GRADUATES	-0.05 (13.99)	—	—	—	-0.11 (39.36)	-0.15 (92.18)
RN'S PER CAPITA	0.04 (34.32)	-0.07 (56.16)	—	-0.04 (13.22)	—	—
LPN'S PER CAPITA	—	-0.20 (101.77)	—	—	-0.06 (12.05)	-0.04 (4.01)
YEAR 1966	-0.13 (42.27)	-0.08 (4.34)	-0.03 (3.51)	—	—	—
YEAR 1967	-0.05 (7.64)	—	—	0.10 (22.27)	—	—
YEAR 1968	—	—	0.06 (5.05)	0.15 (54.40)	—	—
YEAR 1969	—	0.10 (10.89)	0.03 (3.77)	0.21 (111.82)	—	—
YEAR 1970	—	0.33 (129.64)	0.12 (22.28)	—	—	—
YEAR 1971	-0.07 (14.19)	0.43 (224.03)	0.10 (16.43)	—	—	—
YEAR 1972	—	0.53 (338.36)	0.13 (29.15)	0.07 (12.48)	—	0.04 (2.83)
YEAR 1973	0.04 (3.27)	0.49 (272.78)	0.04 (2.14)	—	—	—
YEAR 1974	-0.16 (50.62)	0.42 (181.75)	-0.06 (6.18)	—	—	—
YEAR 1975	-0.11 (21.71)	0.55 (289.43)	—	—	—	—
YEAR 1976	—	0.60 (310.67)	—	—	—	—
YEAR 1977	—	0.63 (300.82)	—	0.05 (3.59)	—	—
YEAR 1978	—	0.66 (296.73)	—	0.09 (10.46)	—	0.05 (3.92)
YEAR 1979	—	0.70 (295.80)	—	—	—	—
ENROLLMENT < 25	-0.10 (8.39)	-0.49 (170.53)	-0.61 (134.63)	—	-0.49 (71.80)	—
25 < ENROLLMENT < 50	—	-0.36 (379.79)	-0.54 (266.94)	0.07 (3.54)	-0.22 (70.27)	—
50 < ENROLLMENT < 100	0.10 (21.10)	-0.13 (108.07)	-0.22 (103.92)	0.24 (46.58)	-0.11 (45.77)	0.21 (15.79)
100 < ENROLLMENT < 200	0.28 (181.50)	—	—	0.47 (182.15)	—	0.29 (37.51)
ENROLLMENT > 200	0.30 (150.62)	—	—	0.59 (249.71)	0.05 (7.82)	0.42 (81.79)
R^2	0.22	0.25	0.28	0.20	0.15	0.25

* Coefficients may be interpreted as changes in proportion of programs receiving financial assistance; partial F-statistics given in parentheses; stepwise selection of explanatory variables causes not all variables to enter all equations.
**Less than 0.005.

Table A-7

REGRESSION RESULTS: RECEIPT/NONRECEIPT OF LOAN/SCHOLARSHIP FUNDS AND RECEIPT/NONRECEIPT OF FORMULA/CAPITATION GRANTS BY TYPE OF PROGRAM* (CONTINUED)
(Ordinary Least Squares Estimates for Dichotomous Dependent Variables)

STATES	FUNDS FOR LOANS/SCHOLARSHIPS			FORMULA/CAPITATION GRANTS		
	Diploma	Associate	Baccalaureate	Diploma	Associate	Baccalaureate
ALABAMA	0.16 (13.45)	—	-0.19 (17.50)	0.12 (6.53)	—	-0.18 (10.68)
ARIZONA	-0.30 (5.14)	0.12 (8.40)	-0.38 (44.59)	—	-0.24 (24.16)	-0.24 (11.66)
ARKANSAS	—	—	—	—	—	—
CALIFORNIA	0.26 (33.28)	—	—	0.14 (9.32)	0.13 (12.20)	-0.12 (7.06)
COLORADO	0.27 (18.03)	—	—	0.31 (19.24)	—	—
CONNECTICUT	-0.13 (16.50)	—	-0.27 (31.05)	—	-0.16 (5.65)	-0.17 (7.58)
DELAWARE	-0.32 (22.70)	—	—	—	-0.18 (2.88)	—
DISTRICT OF COLUMBIA	0.34 (12.93)	—	—	—	—	—
FLORIDA	—	—	-0.26 (37.04)	0.41 (21.24)	0.14 (14.12)	-0.37 (41.72)
GEORGIA	-0.32 (51.30)	-0.38 (131.92)	-0.46 (90.34)	-0.24 (24.56)	-0.30 (57.20)	-0.56 (85.25)
IDAHO	—	0.27 (19.03)	—	—	—	—
ILLINOIS	-0.04 (4.14)	-0.10 (15.41)	0.07 (4.88)	—	—	—
INDIANA	—	-0.18 (24.83)	-0.26 (42.12)	—	-0.13 (6.93)	-0.30 (31.95)
IOWA	0.22 (7.36)	0.10 (4.95)	—	0.36 (68.00)	—	—
KANSAS	0.36 (88.85)	—	—	0.36 (66.60)	—	—
KENTUCKY	0.08 (2.22)	-0.13 (14.02)	-0.31 (39.76)	-0.13 (5.01)	-0.12 (7.99)	-0.37 (74.21)
LOUISIANA	-0.15 (7.30)	-0.32 (26.97)	-0.09 (5.05)	—	-0.12 (2.66)	-0.10 (2.83)
MAINE	0.11 (3.31)	—	-0.41 (21.82)	0.25 (14.92)	—	-0.30 (7.48)
MARYLAND	—	—	—	-0.17 (13.76)	—	—
MASSACHUSETTS	—	-0.19 (22.99)	-0.24 (43.92)	0.12 (16.85)	-0.40 (99.81)	-0.34 (50.50)
MICHIGAN	—	0.15 (26.69)	0.12 (11.82)	-0.08 (4.42)	—	0.17 (12.93)
MINNESOTA	0.13 (11.33)	-0.32 (40.36)	—	0.07 (2.21)	-0.46 (67.41)	—
MISSISSIPPI	—	-0.19 (22.87)	-0.13 (5.30)	—	—	-0.11 (2.68)
MISSOURI	—	—	-0.08 (3.65)	0.07 (3.76)	0.14 (9.11)	-0.11 (3.88)
MONTANA	0.33 (12.70)	—	-0.14 (2.57)	0.38 (13.86)	0.35 (8.00)	—
NEBRASKA	0.24 (30.09)	—	-0.12 (4.29)	0.26 (24.33)	—	-0.34 (44.63)
NEVADA	—	-0.16 (2.77)	-0.54 (33.57)	—	-0.40 (10.69)	-0.81 (45.41)
NEW HAMPSHIRE	—	0.36 (6.20)	—	—	—	—
NEW JERSEY	-0.26 (99.04)	0.08 (4.99)	-0.13 (9.53)	-0.06 (4.09)	—	-0.29 (23.40)
NEW MEXICO	0.70 (4.99)	—	—	0.88 (7.65)	—	—
NEW YORK	—	—	—	—	—	—
NORTH CAROLINA	-0.34 (92.77)	—	-0.37 (16.26)	-0.23 (34.19)	—	-0.42 (81.34)
NORTH DAKOTA	-0.11 (3.01)	0.23 (6.46)	—	—	0.34 (8.59)	—
OHIO	0.20 (80.89)	—	—	0.12 (23.81)	—	—
OKLAHOMA	0.15 (3.41)	—	—	0.17 (3.07)	0.40 (55.65)	—
OREGON	0.25 (8.23)	—	—	—	—	-0.18 (2.96)
PENNSYLVANIA	—	0.11 (10.00)	—	0.06 (6.16)	0.09 (4.95)	0.09 (6.43)
RHODE ISLAND	—	-0.15 (2.59)	—	0.17 (4.98)	-0.48 (17.18)	—
SOUTH CAROLINA	-0.20 (5.99)	-0.14 (9.16)	-0.76 (140.07)	—	—	-0.76 (81.34)
SOUTH DAKOTA	0.30 (20.63)	-0.23 (8.85)	—	0.43 (34.51)	0.20 (4.29)	—
TENNESSEE	—	-0.17 (19.96)	-0.47 (99.91)	—	-0.23 (23.66)	-0.55 (78.35)
TEXAS	—	0.16 (22.31)	—	—	0.28 (45.42)	—
UTAH	0.34 (19.07)	-0.34 (17.14)	-0.40 (39.92)	—	-0.50 (20.18)	-0.43 (25.85)
VERMONT	0.38 (7.20)	0.34 (50.75)	-0.66 (39.32)	0.51 (10.41)	0.18 (3.46)	-0.86 (34.83)
VIRGINIA	-0.12 (15.03)	-0.30 (68.27)	-0.11 (5.98)	-0.15 (19.40)	-0.29 (45.53)	—
WASHINGTON	0.28 (3.29)	0.29 (49.66)	-0.22 (21.36)	0.26 (12.65)	0.17 (14.02)	-0.31 (25.45)
WEST VIRGINIA	—	—	-0.14 (5.76)	—	0.16 (8.81)	-0.14 (3.01)
WISCONSIN	0.13 (11.23)	0.16 (7.32)	-0.18 (18.95)	0.29 (42.08)	0.26 (17.06)	-0.25 (21.57)
WYOMING	—	—	—	—	0.22 (2.40)	—

*Excluded as explicit variable; all coefficients are relative to New York.

Other Programs: $\overline{AID}_t = AID_{t-1} + AID_{t-2} + AID_{t-3}$

Not all types of NTA funding are represented in our models. Aid programs designed solely or partially for graduate students and nurse practitioners are not represented because our analysis is limited to the undergraduate level of nurse training. Special project grants, start-up grants, and financial distress grants are also not represented. We included variables for this latter group of programs in preliminary versions of our models and derived very ambiguous results: estimated coefficients with a mixture of positive and negative signs (mostly negative) and which seldom met standard criteria of statistical significance. After closer examination of the nature of these programs and the distribution of funding across schools and years,* we concluded that we could not evaluate their effects on admissions, attritions, and graduations with the statistical models we use.

We encountered two important problems in obtaining access to data on federal aid, and these difficulties have significant implications for our statistical analysis. First, we discovered relatively late in the study that the information relating to federal aid for 1965 on our data tape was seriously incomplete and that no better data were available from government records. Because of missing data for 1965 and because of the lag structure of our models, we are forced to limit our analyses to the

---

*One problem is created by the fact that legislation and recordkeeping with regard to these programs has changed over time. Start-up grants and financial distress grants were, for a time, included in the special projects category and later funded and reported separately. A second problem arises because start-up grants and distress grants, by their nature, are associated with atypical patterns in enrollment. Third, the objectives of special project grants are so diverse that it is unreasonable to evaluate them in terms of changes in enrollment. Finally, to the extent that special project grants were designed in part to increase enrollments, they are likely to have acted with so differential a lag across programs and years that no standard econometric specification can be found to measure effects.

years 1968 to 1979 for associate programs and 1969 to 1979 for diploma and baccalaureate programs.*

The second major problem of data availability involved information on loans and scholarships for fiscal years 1974 and 1975. During those two years, program records were maintained in regional offices rather than centrally in Washington. With substantial assistance from staff at the Health Resources Administration, we were able to retrieve all data for 1975 and all data except information about loans and scholarships for 1974. To avoid a major gap in the time series on loans and scholarships, we imputed values for the student assistance program for 1974. After some preliminary tests on data for other years, we convinced ourselves that which programs received loans and/or scholarship funds in 1974 could be predicted with reasonable accuracy by a simple procedure. If a given school received loan and/or scholarship funds in both 1973 and 1975, we assigned the loan/scholarship variable a value of 1.0 for 1974. In all other cases, a value of 0.0 was assigned.

The last set of data required by our evaluation models is information on external factors which might explain variations in nursing school enrollments across areas and over time. Among the variables used in previous

---

*To estimate the model for graduations from baccalaureate programs for 1968, for example, we need data on receipt/nonreceipt of aid in 1968, 1967, 1966, and 1965. Since the data for 1965 are not available, we cannot include 1968 and earlier years in our analysis. Had data been available on federal aid for 1965, we could have begun our analysis in 1965. This is so because the dummy variables for aid in 1964, 1963, and 1962 would all have been coded as zero to reflect the fact that NTA funding began in fiscal year 1965. The loss of data for 1965, therefore, significantly constrained our analysis. It should be noted that admissions models could be estimated for years as early as 1966. We choose, however, to use the same set of observations to estimate all models--for maximum comparability of results.

models are wage rates for nurses (higher wages should make nursing more attractive), wage rates for competing occupations (higher wages should reduce nursing enrollments), and the available supply of high school graduates (more potential students should lead to higher enrollments).*

A major decision with respect to measures of these external influences is whether they should be measured for the state in which a nursing school is located, for the county in which it is located, or for some other geographic area. Data from a 1974 survey by the National League for Nursing[34] indicated that 55 percent of potential nursing students apply to nursing schools only in the city in which they live and that 87 percent file applications only within their state of residence.** Surprisingly, there is little variation in these percentages across types of programs. On the basis of the NLN data, we chose to measure external influences on nursing enrollments at the state level.

The following is a list of the variables we have used to measure external influences on admissions, attritions, and graduations for each of the three types of nurse-training programs:

- short-term hospital beds per 1,000 persons;
- population per 100 square miles;
- high school graduates (in millions);
- inpatient days in short-term hospitals per million persons;

---

*Since some entrants to nursing school are 20 years old or older, one might argue for using female population between the ages of 18 and 35 as an explanatory variable. We could not obtain cross-section, time-series data on this variable.

**Data on the geographic dispersion of enrollment (rather than of applications) would provide the best basis for choice of geographic catchment areas of nursing schools.

- employed LPNs per 1,000 persons;
- physicians per 1,000 persons;
- nursing home beds per 1,000 persons;
- state population (in millions);
- employed RNs per 1,000 persons; and
- annual salaries of public school teachers ($1,000s).

The units in which these variables are measured (e.g., population per 100 square miles rather than per square mile) were selected after preliminary statistical runs so that estimated regression coefficients would be of roughly the same magnitude for all variables.*

Although the wage rate for nurses has been featured as an important explanatory variable in other studies[35] of the determinants of nursing school enrollments, we were not able to include such a variable in our evaluation model. Data on nursing wages are not available in the required format--both by state and by year. We have included variables which should reflect variations in supply and demand for nursing services--beds in hospitals and in nursing homes, hospital inpatient days, physicians, employed RNs and employed LPNs. Because nursing wages are influenced by variations in supply and demand, these included variables should serve as proxies for the omitted wage variable. It should also be noted that, to the extent that NTA funding influences nursing school enrollment and ultimately the size of the nursing workforce, nursing wages should be considered as endogenous to a complete model of nursing school enrollment. Since our use of reduced-form equations requires that no endogenous variables be included as explanatory

---

*Adjusting units of measurement (e.g., population in millions rather than thousands) does not affect predictive power or statistical significance for any variables in the regression equations.

variables in our statistical models, it would be technically incorrect to include a variable for nursing wages in our models.

Once the complete data set had been assembled and edited for internal and external consistency, we selected the set of observations which would be included in statistical anlayses.* Any observations for which the datum was missing for any single variable was excluded from all analyses. We also excluded observations from all analyses if we had no data for any of our dependent variables in the previous year. These exclusions were made to ensure that the same set of observations would be used for all analyses, including those in which dependent variables were expressed as changes or percentage changes from the previous year (e.g., first-difference models). One of the effects of our exclusions is that the potentially atypical size of a new school's first graduating class cannot influence our statistical results.

Having a large number of observations to work with and seeking maximum comparability of results across different types of models, we were willing to leave out some observations (i.e., give up some degrees of freedom) in order to have a single, consistent data set for all estimates, tests, and predictions. Across all size categories and types of programs, the final data consists of 1,527 programs and 11,473 observations (program-years). The breakdown by size category and by type of program is shown in Table 3.** As

---

* Only programs in the 48 contiguous states and the District of Columbia are included.

**Within each of the three program types, schools have been divided into three roughly equal groups on the basis of their average enrollment over the years for which data are available. The range of average enrollment used to define a medium size program is 96 to 145 students (inclusive) for diploma programs, 91 to 145 students for associate programs, and 195 to 340 students for baccalaureate programs. Small schools are defined as those with average enrollment below the middle range, and large schools as those with average enrollment above the middle range. By using average enrollment for classifications, we prevent schools from switching categories across years.

the result of various exclusions, about 25 percent of the program-years in the initial data set (contiguous states and DC) were eliminated from the final analytic file.* Descriptive statistics for variables used in various models are presented in tables in the appendix.

*The maximum number of observations which could have been included in the analytic file is 15,389 (5280 for diploma, 6649 for AD, and 3460 for BSN programs). About ten percent of these observations were lost as the result of exclusion of observations for newly opened programs (excluded until year of second graduating class). The remaining 15 percentage point loss is due to various problems of missing or suspect data on one or more variables.

Table 3

NUMBER OF PROGRAMS AND PROGRAM-YEARS IN DATA SET USED FOR ANALYSIS

Type/Size of Program	Number of Programs*	Number of Program-Years
Diploma	580	4,392
Small	195	1,128
Medium	193	1,597
Large	192	1,667
Associate	627	4,594
Small	213	1,256
Medium	207	1,560
Large	207	1,778
Baccalaureate	320	2,487
Small	106	699
Medium	107	828
Large	107	960
All Programs	1,527	11,473

*Count of all of the programs represented on the analytic file for at least one year. Numbers shown overstate the number of programs represented on the file in any single year.

3.0 STATISTICAL RESULTS AND THEIR IMPLICATIONS

We have performed a much larger number of statistical tests than is reasonable to include in this report. Despite our efforts to minimize the volume of statistics, a number of large tables of quantitative results appear below. We have attempted to prepare the text of this section of the report in such a way that readers can skip over the detailed tables and still obtain a relatively thorough understanding of our results.

3.1 General Summary of Statistical Results

The methodology described in the previous section of this report has been used to analyze the behavior of the three outcome variables of primary interest in this study:

- Admissions--number of first-year students entering nursing programs;
- Attritions--change in enrollment not due to admissions or graduations; the net effect of incoming transfers, outgoing transfers, and dropouts;
- Graduations--number of students completing their programs of basic training;

For each of these three variables, analyses were performed separately for small, medium, and large schools within each of the three generic types of programs (diploma, associate, and baccalaureate).*

Although a number of alternative statistical models have been applied during the course of our analsis, statistical results are presented here (see Tables 4, 5 and 6) for only one type of model--one that makes maximum allowance for individual differences in the determinants of admis-

*Our measures of admissions, attritions and graduations count all students entering or leaving nursing programs, including some students (e.g., in BSN programs) who had previously completed another type of nurse training programs (e.g., in a diploma program).

TABLE 4

REGRESSION RESULTS: NUMBER OF NURSING SCHOOL ADMISSIONS, BY TYPE AND SIZE OF PROGRAM*

	DIPLOMA PROGRAMS			ASSOCIATE PROGRAMS			BACCALAUREATE PROGRAMS		
EXPLANATORY VARIABLES	Small	Medium	Large	Small	Medium	Large	Small	Medium	Large
HOSPITAL BEDS PER CAPITA	-1.85 (0.96)	5.86 (2.80)	-16.99 (4.38)	3.11 (1.26)	-5.91 (1.53)	25.46 (2.85)	1.27 (0.24)	5.12 (0.61)	-22.82 (1.47)
HOSPITAL DAYS PER CAPITA	5.56 (0.97)	-15.09 (2.40)	47.75 (3.81)	-4.40 (0.58)	7.60 (0.61)	-94.19 (3.25)	-29.00 (1.68)	-19.71 (0.74)	60.39 (1.19)
SALARIES: PUBLIC SCHOOL TEACHERS	-0.19 (0.29)	-0.73 (1.28)	-1.69 (1.45)	-2.06 (4.08)	-3.15 (3.57)	-3.66 (1.80)	0.85 (0.50)	-1.96 (0.86)	-10.81 (3.05)
POPULATION	6.13 (2.57)	1.12 (0.60)	4.53 (1.46)	-3.61 (2.94)	-6.12 (3.60)	-5.56 (1.43)	-3.92 (1.26)	-12.32 (2.64)	-22.79 (2.49)
POPULATION DENSITY	-12.75 (2.76)	-2.41 (0.35)	3.94 (3.63)	7.94 (0.85)	36.21 (2.04)	-4.59 (1.40)	0.29 (0.24)	-1.03 (0.52)	-6.12 (1.69)
PHYSICIANS PER CAPITA	-13.85 (1.52)	2.72 (0.32)	8.88 (0.62)	-22.91 (2.36)	-5.05 (0.29)	17.87 (0.63)	-13.39 (0.71)	-12.59 (0.40)	-168.89 (3.34)
NURSING HOME BEDS PER CAPITA	1.03 (1.77)	-0.20 (0.57)	-1.01 (1.61)	0.27 (0.46)	-2.47 (3.19)	1.75 (0.91)	0.14 (0.14)	3.27 (2.15)	-1.42 (0.47)
HIGH SCHOOL GRADUATES	-12.12 (2.55)	0.87 (0.22)	-15.25 (2.53)	-2.19 (0.66)	2.21 0.54	-34.81 (3.60)	13.50 (1.93)	-6.38 (0.55)	-20.75 (1.13)
RN'S PER CAPITA	0.73 (0.52)	-1.65 (1.35)	-2.08 (0.84)	1.83 (1.42)	-4.46 (1.94)	-6.08 (1.13)	-7.34 (1.87)	5.41 (1.11)	0.11 (0.01)
LPN'S PER CAPITA	1.21 (0.86)	0.67 (0.48)	4.75 (1.69)	-3.68 (1.84)	2.22 (0.70)	-21.42 (2.67)	4.75 (1.06)	-14.86 (2.12)	-23.29 (2.03)
YEAR 1969	—	—	—	5.38 (2.42)	7.50 (2.31)	4.93 (0.69)	—	—	—
YEAR 1970	0.98 (0.84)	3.25 (2.13)	-1.64 (0.50)	10.88 (4.60)	9.83 (2.54)	22.94 (2.38)	3.50 (0.96)	4.53 (0.37)	23.11 (1.22)
YEAR 1971	6.64 (4.22)	9.82 (3.37)	7.01 (1.90)	18.49 (7.09)	20.76 (4.69)	47.53 (4.32)	15.64 (2.46)	22.12 (1.75)	65.84 (3.32)
YEAR 1972	7.94 (3.74)	13.29 (5.91)	11.23 (2.62)	25.40 (8.86)	28.40 (5.62)	65.78 (5.45)	14.51 (2.24)	29.34 (2.38)	117.38 (5.60)
YEAR 1973	7.31 (2.87)	11.98 (4.57)	9.92 (2.04)	28.44 (8.86)	34.78 (6.12)	71.32 (5.40)	14.59 (2.09)	31.86 (2.42)	132.58 (5.91)
YEAR 1974	7.99 (2.50)	13.29 (4.29)	10.41 (1.84)	31.95 (8.85)	37.00 (5.70)	78.37 (5.27)	18.09 (2.25)	43.90 (2.96)	155.68 (6.28)
YEAR 1975	9.39 (2.42)	14.95 (4.08)	13.04 (1.97)	36.23 (8.79)	42.58 (5.71)	81.76 (4.85)	16.95 (1.84)	45.85 (2.71)	171.12 (6.21)
YEAR 1976	8.98 (1.98)	14.17 (3.35)	8.33 (1.06)	39.19 (8.29)	45.85 (5.34)	69.72 (3.66)	18.30 (1.73)	54.72 (2.87)	184.33 (6.05)
YEAR 1977	8.53 (1.62)	11.84 (2.43)	5.71 (0.63)	42.37 (7.98)	49.97 (5.13)	72.55 (3.41)	19.35 (1.60)	58.52 (2.71)	207.44 (6.07)
YEAR 1978	7.70 (1.28)	11.06 (1.99)	2.95 (0.28)	46.18 (7.81)	52.37 (4.79)	71.89 (3.02)	15.54 (1.13)	56.40 (2.30)	217.65 (5.67)
YEAR 1979	5.91 (0.87)	9.09 (1.45)	0.02 (0.00)	48.61 (7.40)	46.93 (3.85)	56.54 (2.16)	8.38 (0.54)	50.70 (1.85)	213.20 (5.04)
FORMULA GRANTS 1965-69	-0.06 (0.04)	5.35 (2.73)	1.49 (0.40)	—	—	—	—	—	—
LOANS/SCHOLARSHIPS 1965-69	4.13 (2.39)	1.26 (0.64)	0.69 (0.18)	4.45 (1.41)	-7.45 (2.03)	-0.68 (0.07)	6.25 (1.20)	8.70 (0.83)	32.18 (1.84)
LOANS/SCHOLARSHIPS 1970-71	3.30 (3.06)	1.55 (1.32)	0.61 (0.26)	-0.03 (0.02)	-3.79 (1.56)	-4.42 (0.73)	-3.34 (0.70)	11.35 (1.35)	28.02 (2.29)
CAPITATION 1972-75	3.37 (4.02)	4.32 (4.96)	8.83 (5.41)	1.45 (1.51)	3.99 (2.47)	-1.15 (0.27)	3.73 (1.44)	13.47 (1.98)	-5.39 (0.41)
LOANS/SCHOLARSHIPS 1972-75	-0.78 (0.80)	1.22 (1.11)	-1.28 (0.61)	-0.33 (0.30)	-0.78 (0.43)	-9.90 (1.97)	-2.13 (0.59)	-1.25 (0.18)	10.40 (0.76)
CAPITATION 1976-79	5.09 (4.64)	7.23 (7.54)	14.40 (8.31)	6.42 (6.64)	4.03 (2.06)	15.13 (3.11)	17.82 (5.79)	13.97 (1.81)	71.14 (0.83)
LOANS/SCHOLARSHIPS 1976-79	-1.45 (1.20)	1.38 (1.12)	1.21 (0.48)	-2.83 (2.23)	1.41 (0.61)	3.88 (0.67)	-16.01 (3.87)	-4.51 (0.56)	-4.30 (0.28)
CONSTRUCTION 1965-79	-1.49 (0.37)	11.64 (1.30)	3.03 (0.32)	-2.33 (0.67)	23.82 (3.91)	10.74 1.53	0.47 (0.11)	0.76 (0.09)	3.00 (0.34)
R^2	0.18	0.23	0.17	0.26	0.24	0.22	0.26	0.21	0.19
Durbin-Watson Statistic	1.90	1.60	1.61	1.68	1.32	1.17	1.49	1.35	1.70

*The estimated regression coefficient and (in parenthesis, expressed as an absolute value) the corresponding t-statistic are displayed for each explanatory variable in a given model.

TABLE 5

REGRESSION RESULTS: NUMBER OF NURSING SCHOOL ATTRITIONS, BY TYPE AND SIZE OF PROGRAM*

EXPLANATORY VARIABLES	DIPLOMA PROGRAMS			ASSOCIATE PROGRAMS			BACCALAUREATE PROGRAMS		
	Small	Medium	Large	Small	Medium	Large	Small	Medium	Large
HOSPITAL BEDS PER CAPITA	1.30 (0.58)	-1.53 (0.66)	-8.16 (1.88)	-1.82 (0.63)	-4.58 (1.08)	1.46 (0.12)	2.34 (0.30)	-4.22 (0.35)	-48.66 (2.11)
HOSPITAL DAYS PER CAPITA	-1.90 (0.58)	4.68 (0.66)	13.00 (0.92)	8.67 (0.97)	5.11 (0.38)	-20.73 (0.54)	-35.34 (1.40)	17.63 (0.47)	133.70 (1.77)
SALARIES: PUBLIC SCHOOL TEACHERS	0.06 (0.08)	0.01 (0.02)	-2.12 (1.63)	-1.42 (2.38)	-1.92 (1.99)	-1.71 (0.66)	1.08 (0.44)	4.01 (1.23)	-10.45 (2.00)
POPULATION	-0.00 (0.00)	-1.47 (0.71)	2.67 (0.77)	-4.81 (3.52)	-4.46 (2.42)	-9.52 (1.87)	-1.98 (0.43)	-1.05 (0.16)	17.34 (1.27)
POPULATION DENSITY	7.69 (1.44)	6.30 (0.81)	1.37 (1.13)	2.53 (0.23)	15.41 (0.80)	-3.59 (0.83)	2.27 (1.25)	1.15 (0.40)	-2.85 (0.53)
PHYSICIANS PER CAPITA	-7.80 (0.72)	5.86 (0.61)	1.01 (0.06)	-2.96 (0.26)	23.95 (1.27)	-18.23 (0.49)	10.10 (0.37)	31.27 (1.12)	6.92 (0.09)
NURSING HOME BEDS PER CAPITA	0.64 (0.92)	-0.17 (0.43)	0.32 (0.46)	-0.27 (0.40)	0.01 (0.01)	4.21 (1.65)	1.43 (0.96)	6.01 (2.77)	2.04 (0.45)
HIGH SCHOOL GRADUATES	0.76 (0.14)	1.33 (0.30)	-1.98 (0.29)	-5.86 (1.51)	-0.94 (0.21)	-17.62 (1.38)	-15.01 (1.48)	-4.09 (0.25)	72.55 (2.65)
RN'S PER CAPITA	-5.04 (3.07)	1.10 (0.80)	-3.83 (1.39)	-1.67 (1.10)	-6.33 (2.53)	-9.28 (1.32)	-5.96 (1.00)	1.44 (0.20)	-10.96 (0.92)
LPN'S PER CAPITA	-0.23 (0.14)	3.95 (2.54)	2.50 (0.79)	-2.17 (0.92)	-1.50 (0.43)	-16.47 (1.55)	0.70 (0.11)	-14.26 (1.42)	4.19 (0.25)
YEAR 1969	---	---	---	2.44 (0.93)	8.26 (2.35)	-1.18 (0.13)	---	---	---
YEAR 1970	0.01 (0.01)	-2.68 (2.13)	-8.70 (3.70)	4.51 (1.70)	3.79 (1.00)	-2.43 (0.23)	-13.98 (2.96)	-14.54 (1.76)	-39.07 (2.75)
YEAR 1971	-0.76 (0.44)	-2.47 (1.41)	-9.48 (2.89)	6.85 (2.36)	4.31 (0.97)	3.97 (0.31)	-7.76 (1.21)	-8.79 (0.81)	-16.54 (0.87)
YEAR 1972	2.43 (1.00)	-1.62 (0.68)	-0.43 (0.10)	9.73 (2.91)	9.88 (1.81)	2.67 (0.16)	-10.74 (1.16)	-11.45 (0.74)	-18.53 (0.71)
YEAR 1973	3.37 (1.14)	0.47 (0.17)	0.21 (0.04)	12.74 (3.42)	12.03 (1.98)	10.03 (0.59)	-9.16 (0.87)	-20.55 (1.14)	5.84 (0.19)
YEAR 1974	3.95 (1.06)	-1.63 (0.49)	4.19 (0.66)	11.97 (2.79)	11.57 (1.61)	33.77 (1.72)	-11.57 (0.99)	-26.57 (1.36)	28.85 (0.87)
YEAR 1975	3.12 (0.69)	-4.37 (1.09)	-3.29 (0.43)	17.08 (3.50)	11.48 (1.40)	32.60 (1.47)	-14.71 (1.06)	-44.02 (1.92)	48.00 (1.26)
YEAR 1976	4.84 (0.91)	-4.10 (0.88)	1.17 (0.13)	20.35 (3.68)	16.43 (1.75)	40.42 (1.62)	-13.48 (0.84)	-39.75 (1.50)	38.10 (0.88)
YEAR 1977	5.99 (0.97)	-3.37 (0.67)	0.10 (0.01)	21.45 (3.44)	19.00 (1.78)	47.95 (1.73)	-15.48 (0.87)	-48.43 (1.61)	62.92 (1.30)
YEAR 1978	6.86 (0.97)	-2.73 (0.44)	4.17 (0.36)	26.63 (3.80)	19.35 (1.61)	38.68 (1.24)	-23.06 (1.15)	-57.21 (1.67)	70.78 (1.28)
YEAR 1979	6.43 (0.81)	-3.70 (0.53)	-0.84 (0.06)	25.36 (3.25)	14.77 (1.10)	19.01 (0.55)	-29.17 (1.28)	-78.47 (2.04)	54.60 (0.88)
FORMULA GRANTS 1965-69	-0.45 (0.69)	1.85 (2.85)	1.07 (0.87)	---	---	---	---	---	---
LOANS/SCHOLARSHIPS 1965-69	1.27 (1.94)	-0.79 (1.14)	-2.87 (2.20)	-0.01 (0.01)	-6.27 (3.30)	7.32 (1.88)	4.16 (2.22)	-5.77 (1.70)	13.95 (2.32)
LOANS/SCHOLARSHIPS 1970-71	1.17 (1.73)	1.39 (2.05)	-3.18 (2.29)	0.20 (0.19)	-1.44 (0.97)	9.42 (2.01)	0.97 (0.28)	-6.45 (1.24)	7.10 (0.89)
CAPITATION 1972-75	1.92 (3.00)	1.10 (2.10)	2.54 (2.63)	-0.83 (1.21)	0.81 (0.74)	-0.57 (0.16)	-0.40 (0.21)	-0.66 (0.14)	-17.03 (1.69)
LOANS/SCHOLARSHIPS 1972-75	0.60 (1.08)	0.40 (0.68)	-3.53 (3.02)	0.08 (0.11)	-0.88 (0.78)	-4.31 (1.18)	1.86 (0.87)	2.42 (0.51)	15.40 (1.53)
CAPITATION 1976-79	0.32 (0.35)	-0.06 (0.10)	3.81 (3.24)	0.70 (0.90)	-0.98 (0.61)	4.24 (0.84)	-2.13 (0.69)	5.21 (0.76)	24.51 (1.53)
LOANS/SCHOLARSHIPS 1976-79	1.29 (1.65)	-0.28 (0.36)	-2.32 (1.55)	-0.27 (0.31)	0.96 (0.58)	-2.09 (0.38)	7.24 (2.23)	0.09 (0.01)	-21.32 (1.30)
CONSTRUCTION 1965-79	0.16 (0.11)	4.81 (3.30)	1.41 (0.57)	-0.51 (0.27)	4.89 (1.91)	9.17 (2.13)	0.39 (0.23)	-4.56 (1.07)	3.79 (0.84)
R^2	0.06	0.05	0.06	0.05	0.06	0.05	0.06	0.05	0.06
Durbin-Watson Statistic	2.16	2.17	2.27	2.50	2.06	2.54	2.57	2.25	2.02

*The estimated regression coefficient and (in parenthesis, expressed as an absolute value) the corresponding t-statistic are displayed for each explanatory variable in a given model.

TABLE 6

REGRESSION RESULTS: NUMBER OF NURSING SCHOOL GRADUATIONS, BY TYPE AND SIZE OF PROGRAM*

	DIPLOMA PROGRAMS			ASSOCIATE PROGRAMS			BACCALAUREATE PROGRAMS		
EXPLANATORY VARIABLES	Small	Medium	Large	Small	Medium	Large	Small	Medium	Large
HOSPITAL BEDS PER CAPITA	-1.76 (0.97)	-0.92 (0.46)	-3.48 (1.08)	2.41 (1.16)	3.07 (1.10)	15.28 (2.72)	5.88 (1.74)	-0.58 (0.11)	24.51 (2.45)
HOSPITAL DAYS PER CAPITA	6.00 (1.10)	2.91 (0.48)	11.90 (1.14)	-9.69 (1.52)	-8.85 (0.99)	-75.63 (4.16)	-20.58 (1.86)	23.60 (1.40)	-91.60 (2.79)
SALARIES: PUBLIC SCHOOL TEACHERS	0.86 (1.44)	-1.41 (2.39)	-1.51 (1.56)	-0.61 (1.43)	-0.63 (0.99)	-1.71 (1.34)	2.12 (1.97)	-3.41 (2.33)	1.71 (0.75)
POPULATION	10.35 (4.60)	4.32 (2.42)	0.87 (0.34)	-1.78 (1.83)	-3.83 (3.14)	-0.23 (0.10)	-2.56 (1.27)	-5.41 (1.80)	-10.21 (1.72)
POPULATION DENSITY	-2.29 (0.53)	7.60 (1.14)	1.33 (1.48)	3.23 (0.41)	14.68 (1.15)	3.67 (1.78)	-1.79 (2.25)	-0.20 (0.15)	-2.54 (1.08)
PHYSICIANS PER CAPITA	-31.88 (3.63)	-12.84 (1.56)	6.24 (0.53)	-1.18 (0.14)	-16.07 (1.29)	19.56 (1.10)	-39.14 (3.23)	-7.31 (0.36)	-16.94 (0.51)
NURSING HOME BEDS PER CAPITA	0.57 (1.02)	0.43 (1.29)	-0.16 (0.31)	0.18 (0.37)	-1.60 (2.88)	-2.27 (1.85)	1.00 (1.52)	1.92 (1.98)	3.92 (1.98)
HIGH SCHOOL GRADUATES	-3.89 (0.86)	1.33 (0.35)	-2.95 (0.59)	8.77 (3.15)	0.52 (0.17)	5.09 (0.83)	13.75 (3.08)	-17.46 (2.36)	5.17 (0.44)
RN'S PER CAPITA	4.75 (3.57)	-1.21 (1.03)	-2.76 (1.34)	1.70 (1.56)	1.42 (0.86)	-5.05 (1.50)	2.33 (0.89)	4.39 (1.37)	-1.90 (0.37)
LPN'S PER CAPITA	1.75 (1.30)	-1.17 (0.88)	3.11 (1.33)	0.51 (0.30)	2.64 (1.16)	0.49 (0.10)	4.68 (1.62)	-13.93 (3.10)	0.34 (0.05)
YEAR 1969	—	—	—	1.90 (1.02)	4.47 (1.93)	1.88 (0.42)	—	—	—
YEAR 1970	-2.22 (2.27)	-1.37 (1.46)	-0.95 (0.55)	3.45 (1.82)	7.03 (2.83)	7.82 (1.54)	0.77 (0.37)	12.23 (3.31)	10.61 (1.72)
YEAR 1971	-1.89 (1.34)	-0.90 (0.60)	4.09 (1.67)	4.40 (2.13)	11.43 (3.90)	13.35 (2.17)	1.66 (0.59)	12.40 (2.55)	19.04 (2.31)
YEAR 1972	-2.80 (1.42)	0.59 (0.29)	8.25 (2.48)	6.97 (2.92)	17.46 (4.85)	25.63 (3.31)	-2.73 (0.68)	18.71 (2.70)	20.60 (1.82)
YEAR 1973	-3.64 (1.52)	3.21 (1.32)	10.49 (2.62)	10.53 (3.96)	23.55 (5.88)	40.29 (4.92)	0.76 (0.17)	27.16 (3.38)	36.38 (2.78)
YEAR 1974	-0.87 (0.29)	7.19 (2.30)	11.75 (2.48)	14.56 (4.75)	28.75 (6.07)	46.92 (4.98)	5.63 (1.10)	47.56 (5.44)	39.38 (4.12)
YEAR 1975	1.05 (0.29)	12.71 (3.71)	13.83 (2.44)	16.84 (4.84)	34.39 (6.40)	52.23 (4.94)	10.68 (1.75)	71.82 (7.01)	77.23 (4.66)
YEAR 1976	0.68 (0.16)	13.85 (3.48)	13.81 (2.09)	16.39 (4.20)	35.32 (5.72)	53.93 (4.53)	11.42 (1.63)	81.75 (6.88)	86.22 (4.61)
YEAR 1977	-0.20 (0.04)	15.69 (3.43)	14.35 (1.90)	17.39 (3.96)	38.70 (5.52)	52.82 (3.98)	13.63 (2.01)	84.37 (6.30)	84.55 (4.01)
YEAR 1978	0.33 (0.06)	15.19 (2.89)	16.01 (1.84)	15.82 (3.16)	41.22 (5.20)	46.75 (3.14)	16.93 (1.93)	94.00 (6.15)	85.37 (3.56)
YEAR 1979	-0.95 (0.15)	15.40 (2.57)	17.21 (1.74)	16.88 (3.04)	41.14 (4.66)	46.32 (2.82)	18.86 (1.90)	102.00 (5.92)	85.36 (3.17)
FORMULA GRANTS 1965-69	0.51 (0.97)	-0.62 (1.12)	0.80 (0.88)	—	—	—	—	—	—
LOANS/SCHOLARSHIPS 1965-69	-0.63 (1.19)	0.79 (1.34)	-0.51 (0.52)	1.65 (1.31)	1.53 (1.22)	-2.99 (1.60)	1.34 (1.63)	3.70 (2.44)	0.65 (0.25)
LOANS/SCHOLARSHIPS 1970-71	0.03 (0.05)	0.58 (1.00)	-1.11 (1.08)	0.57 (0.76)	0.63 (0.64)	-4.00 (1.78)	0.23 (0.23)	7.76 (3.34)	-4.16 (1.20)
CAPITATION 1972-75	0.40 (0.77)	1.64 (3.66)	2.33 (3.24)	1.52 (3.14)	1.05 (1.47)	-1.31 (0.78)	0.90 (1.08)	1.35 (0.63)	4.39 (1.00)
LOANS/SCHOLARSHIPS 1972-75	-0.93 (2.07)	0.40 (0.79)	1.55 (1.78)	-0.09 (0.19)	0.25 (0.34)	-0.32 (0.17)	-0.93 (1.00)	0.68 (0.32)	-12.35 (2.82)
CAPITATION 1976-79	1.13 (1.55)	0.85 (1.58)	3.52 (4.01)	2.02 (3.65)	3.91 (3.71)	3.21 (1.34)	4.20 (3.12)	-0.76 (0.25)	-7.28 (1.05)
LOANS/SCHOLARSHIPS 1976-79	-1.40 (2.22)	1.75 (2.70)	1.24 (1.11)	-0.53 (0.87)	-2.18 (2.00)	1.02 (0.39)	-7.18 (5.03)	5.57 (1.78)	-3.47 (0.49)
CONSTRUCTION 1965-79	-0.53 (0.42)	2.45 (1.97)	7.43 (4.01)	0.35 (0.25)	3.45 (2.05)	0.32 (0.16)	1.28 (1.70)	2.63 (1.39)	7.41 (3.77)
R^2	0.14	0.21	0.20	0.36	0.45	0.45	0.55	0.52	0.53
Durbin-Watson Statistic	2.23	1.79	1.76	1.67	1.76	1.15	1.47	1.61	0.91

*The estimated regression coefficient and (in parenthesis, expressed as an absolute value) the corresponding t-statistic are displayed for each explanatory variable in a given model.

sions, attritions, and graduations across schools (e.g., a particularly attractive campus or affiliation with a well known hospital).* For the reasons given in the previous section of this paper, we believe that this type of model provides the best basis for estimation of the effects of NTA funds. Estimates of the effects of NTA funding that we obtained from our alternative statistical models are essentially equivalent to the results presented here. The lack of sensitivity of evaluation results to the choice of statistical models is an important result, for it indicates that our conclusions are not dependent upon choice of measures for specific variables nor choice of estimation technique.**

The predictive power of our models for admissions and graduations is much higher than corresponding models for attritions. Between 17 and 28 percent of the variation in admissions and between 14 and 55 percent of the variation in graduations is explained by the combination of variables represented in our models. In contrast, only five to six percent of the variation in attritions is explained by the same set of variables. Since there has been no research on nursing education which has analyzed a similar large set of data, it is difficult to evaluate the performance of our models on the basis of predictive power.[36]

---

* The term "fixed-effects" is used to refer to our preferred statistical models because of the ability of the models to allow for influences which are unique to specific schools but which remain relatively fixed over time. Time-related influences are accounted for by explicit inclusion of explanatory variables such as hospital days per capita and employed RNs per capita as well as by inclusion of dummy variables to allow for year-specific influences on admissions, attritions or graduations (e.g., expansion of general federal aid for postsecondary education in 1972).

**Estimates of overall NTA effects were essentially unchanged from those reported here when, for example, we measured admissions as first differences, percentage changes from one year to the next, or simply as the number of admissions in the current year. Also, ordinary least squares estimation produced essentially the same results as fixed effects estimation.

In an analysis such as ours, one typically tests for time-related patterns in prediction errors made by the statistical models. If we look at the pattern of prediction errors from one year to the next across schools, we might find a systematic pattern of an underprediction in one year usually followed by an overprediction in the next year. Alternatively, we might find several sequential years of overpredictions typically followed by another set of years of underpredictions. If either of these two types of nonrandom patterns is found, standard procedures for testing the reliability (statistical significance) of estimated effects can be expected to be too stringent (the first of the two types of patterns of errors) or too lenient (the second type of pattern). For most of the analyses reported here, there is some evidence of systematic patterns in prediction errors. We should expect measures of reliability to be somewhat too stringent when used to test for the existence of effects of NTA funding on admissions and graduations and somewhat too lenient when used to test for effects on attritions.*

Solely on the results in Tables 4, 5 and 6, one would conclude that there is little evidence that variation in any of the three outcome variables (admissions, attritions and graduations) is systematically related to the set of variables we have used to measure external indicators of the attractiveness of a nursing education. Such variables as hospital beds per capita, hospital days per capita, nursing home beds per capita, and physicians per capita should serve as proxies for the demand for nurses in the geographic area from which a nursing school might draw potential students. Our hypo-

---

*Durbin-Watson statistics tend to indicate positive autocorrelation in equations for admissions and graduations and negative autocorrelation in equations for attritions. Standard errors of regression coefficients are biased downward by positive autocorrelation and biased upward by negative autocorrelation.

thesis, that each of these variables should be positively correlated with admissions and graduations and negatively correlated with attritions, is not supported in any consistent fashion by the statistical results in Tables 4 through 6. We had also expected RNs per capita and LPNs per capita to be negatively associated with admission and graduations. Number of high school graduates should be positively correlated with admissions and graduations. Again, none of these hypotheses are consistently supported by results shown in Tables 4 through 6. The one hypothesized relationship that is supported by the tables is a negative association between wage rates for a competing occupation (teaching) and nursing admissions and graduations.

We believe there is a very plausible explanation for the lack of a consistent pattern in Tables 4 through 6 in the implied relationships between our dependent variables and the variables we have used to measure external incentives/ disincentives for nursing education. The various measures of external influences are highly correlated with one another in our data set, and these high correlations virtually assure instability of statistical results. If a negative relationship is implied by one model, a positive correlation is likely to be indicated by another model. The pattern of results obtained for hospital beds per capita and hospital patient days per capita provides an excellent illustration. Because these two variables are very highly correlated, there is a high likelihood that, whenever a positive relationship in indicated between one of them and the dependent outcome variable, a negative relationship will be indicated for the other. In fact, exactly this pattern occurs in every one of our 27 sets of results.*

*When simple correlation coefficients are used to examine relationships between admissions, attritions or graduations and each of our measures of external influence, the results generally are consistent with a priori hypotheses about directions of effect. Use of stepwise regression methods to select significant variables also generally produces regression coefficients of the correct sign.

It is very important to recognize that the inconsistent pattern of associations between outcome variables and our measures of external incentives/disincentives for nursing education does not undermine the predictive power of the statistical models. Nor does the estimated pattern of the relationship necessarily reduce the utility of the models as vehicles for measuring and testing the effects of NTA funding. The primary problem is that the statistical results cannot be used to assess accurately the effects on nursing enrollments of variations in any one of our measures of external influences. Since the effects of these external influences is not a focus of this study, there is no major cause for concern.

Among the explanatory variables included in all of the statistical models are a set of variables which are designed to show variations in the trend in outcome variables over time (listed as YEAR 1970, YEAR 1971, etc. in the stastistical tables).* A relatively smooth upward trend is demonstrated for admissions and for graduations. No trend is indicated, however, for attritions. This pattern of results has an important implication with regard to the effectiveness of nursing schools in retaining enrolled students. Despite the fact that average enrollments have increased each year, the number of students dropping out of programs has not changed. The statistical results demonstrate, therefore, a steady increase in retention rates. This finding is consistent across virtually all sizes and types of programs.

3.2 Estimated Effects of NTA Funding

As was discussed in the previous section of the report, eight variables are included in the statistical models to reflect receipt/

---

*These year-specific dummy variables are constructed in such a way that YEAR 1970, for example, has a value of 1.0 for all 1970 school years and a value of 0.0 for all other school years.

nonreceipt of various types of NTA funding within each of the periods covered by a major piece of NTA legislation:

- Formula Grants, 1965-1969
- Loans/Scholarships, 1965-1969
- Loans/Scholarships, 1970-1971
- Capitation Grants, 1972-1975
- Loans/Scholarships, 1972-1975
- Capitation Grants, 1976-1979
- Loans/Scholarships, 1976-1979
- Construction Grants, 1965-1979

In each case, the variable measures not how much funding a school received in a given year but whether or not funding was received. As was described earlier, the manner in which the variables are constructed is somewhat different for construction grants than for the other variables. Furthermore, the variables which appear in models for admissions are modified to a degree before they are included in models for attritions and graduations. The reason for this latter modification is that the admissions variable is hypothesized to depend upon receipt/nonreceipt of funding in the current year, whereas attritions and graduations are expected to depend on receipt/nonreceipt of funding not only in the current year but in previous years as well.

When variables representing financial aid are added to our statistical models, a regression coefficient and a standard error are calculated for each variable for each model. The regression coefficients estimate the changes in outcome variables which result from schools' receiving each of the various types of financial assistance. The standard errors are used to test the statistical significance (reliability) of the effects implied by the

regression coefficients. For example, in the model for admissions at medium-size associate programs the variable CAPITATION:1972-1975 has a regression coefficient of 3.99 and a standard error of 1.62. The first of these two values implies that admissions increased by an average of about four students per year at those schools which received capitation grants between 1972 and 1975. The ratio of the regression coefficient to its standard error, called a t-statistic, is approximately 2.5. If there were no real, systematic relationship between admissions and receipt of capitation grants, one could obtain a coefficient/error ratio as high as 2.5 by chance. However, statistical tables indicate that the odds of obtaining so high a value are only 1 in 250. We therefore choose to reject the hypothesis that there is no real, systematic relation rather than believe an extraordinarily rare event has occurred. The higher the coefficient/error ratio (t-statistic) we obtain, the more confidence we have that a real and systematic (statistically significant) relationship exists.

We have a relatively clear set of expectations about the results we should obtain when aid variables are added to our models for admissions and graduations. Because we believe that NTA funding has caused an increase in admissions and graduations, we expect regression coefficients for all of the aid variables in these models to be positive. Furthermore, we expect each of the coefficients to be at least 1.65 times as large as its standard error--to indicate that the effect of aid is not only positive on average, but positive consistently enough across schools and years to not be due to chance.*

---

*We are using a one-tailed test (because we expect a non-negative effect of aid on admissions and graduations) and a 95-percent confidence level in tests of the statistical significance of coefficients in models for admissions and graduations.

In the case of attritions, our expectations about coefficients are not so unambiguous. One might argue, for example, that NTA funding should have reduced attritions, by reducing the frequency of students' dropping out of school for financial reasons. On the basis of this argument, one would expect negative coefficients for aid variables in attrition models. In contrast, one might argue that NTA funding increased attritions, by attracting marginal students who later drop out of school with higher than average frequency. Accepting this reasoning, one would expect positive coefficients for aid variables in attrition models. Lacking unambiguous expectations, we will let the results indicate whether the aid/attrition relationship is positive or negative. However, we will apply a stricter criterion for statistical significance (t-statistics of 1.96, rather than 1.65) in examining results from attrition models--to reflect the fact that we are uncertain not only about whether or not there is a relationship but also about the plausible direction (positive or negative) of the relationship.*

There are two reasons why we cannot apply statistical tests in a straightforward manner in this study. First, we must adjust our interpretations to reflect the fact that, with a large number of statistical tests to perform (multiple models and multiple aid variables), we must expect some of the results to violate our expectations simply as a result of chance.** Rather than examining each regression coefficient in isolation, we

---

* For attrition models, we apply a two-tailed test at the 95-percent confidence level.

**If there is no statistical relationship between two variables and one performs a large number of independent tests for the existence of a relationship, about five percent of the time (95-percent confidence levels used) one will find evidence that a relationship does exist. If a relationship does exist, one will sometimes find, in multiple tests, no evidence of a relationship. The frequency of this latter event will be approximately equal to 1.0 minus the power of the test. The tests we perform are too complex for statistical power to be calculated.

look for a pattern in the results which is internally consistent and which conforms to some reasonable interpretation. Second, we must consider the degree to which results may be affected by various estimation problems--misspecification of the statistical models, high correlations among explanatory variables, and errors in the measurement of variables. Our interpretations must take account of the possible distortions such problems may cause. For both of these reasons, some degree of subjectivity is required for correct interpretations and conclusions.

The statistical results in Tables 4 through 6 indicate that expectations about signs and statistical significance of regression coefficients for aid variables are not fully realized. For the models for admissions and graduations, a total of 132 regression coefficients for aid variables are reported. Two-thirds of these coefficients are positive (88 coefficients), but only 36 coefficients (27 percent) are both positive and statistically significant. In the attrition models, 39 coefficients are positive, but only 12 are both positive and statistically significant. The remaining 27 coefficients of aid variables in the attrition models are negative, but only four are both negative and statistically significant. These simple counts, of course, do not provide an adequate basis for conclusions.

A major cause of our finding a mixture of positive and negative regression coefficients is the existence of high correlations among the variables used to represent NTA funding. For diploma programs before 1970 and for all programs after 1971, there was a very high overlap between the schools which received formula/capitation grants and the schools which received loan/scholarship funds (see Table 7). These overlaps cause high

Table 7

DISTRIBUTION ON NURSING PROGRAMS BY RECEIPT/NONRECEIPT OF FORMULA/CAPITATION GRANTS AND LOAN/SCHOLARSHIP FUNDS BY SIZE AND TYPE OF PROGRAM BY YEAR (Number of Programs)

Type of Program/Year	SMALL				MEDIUM				LARGE			
	Neither Type of Funding	Both Types of Funding	Form./ Capit. Grants Only	Loan/ Scholar. Funds Only	Neither Type of Funding	Both Types of Funding	Form./ Capit. Grants Only	Loan/ Scholar. Funds Only	Neither Type of Funding	Both Types of Funding	Form./ Capit. Grants Only	Loan/ Scholar. Funds Only
DIPLOMA												
1969	98	52	12	14	61	86	22	8	35	109	15	13
1970	92	0	0	68	71	0	0	103	47	0	0	127
1971	85	0	0	53	72	0	0	104	50	0	0	123
1972	47	27	21	28	41	66	21	35	19	98	20	31
1973	51	17	6	30	40	62	3	49	22	100	11	28
1974	51	7	10	21	47	43	9	40	27	78	19	29
1975	49	11	1	19	42	49	6	36	27	81	9	28
1976	37	15	2	19	32	47	7	40	19	79	9	31
1977	31	14	4	17	28	56	5	35	19	76	6	35
1978	30	15	4	14	27	48	8	33	15	74	7	31
1979	22	9	4	21	26	37	9	41	15	44	8	53
ASSOCIATE												
1968	21	0	0	3	29	0	0	11	35	0	0	31
1969	25	0	0	6	33	0	0	16	33	0	0	37
1970	26	0	0	21	31	0	0	45	27	0	0	65
1971	27	0	0	34	33	0	0	73	29	0	0	113
1972	19	26	7	29	14	56	11	36	13	95	3	37
1973	25	28	9	33	29	78	7	18	36	104	2	20
1974	31	33	10	37	34	70	21	21	41	100	13	16
1975	32	62	5	28	39	90	13	18	37	105	7	21
1976	35	63	11	35	46	105	5	19	42	119	5	15
1977	39	83	15	31	49	102	7	20	49	122	3	16
1978	46	96	18	26	56	103	10	19	50	125	2	18
1979	47	87	19	28	64	102	6	19	48	115	2	27
BACCALAUREATE												
1969	13	0	0	31	8	0	0	40	11	0	0	55
1970	8	0	0	38	5	0	0	47	11	0	0	58
1971	6	0	0	43	9	0	0	54	14	0	0	61
1972	5	29	1	16	6	55	1	4	9	70	2	4
1973	8	37	2	11	20	53	0	3	15	70	1	3
1974	9	42	4	10	25	48	4	3	20	63	2	2
1975	13	45	2	9	22	55	3	2	25	65	2	3
1976	14	49	1	7	24	59	0	2	25	68	1	1
1977	15	55	2	5	19	66	1	4	26	69	0	4
1978	16	61	3	7	20	67	1	5	22	73	1	4
1979	15	49	2	16	22	64	2	5	28	65	0	7

correlations among pairs of aid variables for any legislative cycle--between CAPITATION:1972-1975 and LOANS/SCHOLARSHIPS:1972-1975, for example. These correlations, in turn, produce a high frequency of pairs of positive and negative regression-coefficients.* Nearly half of the 71 negative coefficients for aid variables across the complete set of regression equations occur as part of such paris of positive/negative values.

When we discovered the high correlations for certain pairs of our variables for federal aid, we considered two possible responses. First, we could convert our separate variables for formula/capitation grants and loan/scholarship funds into a single variable which would indicate receipt/nonreceipt of either or both types of financial assistance. This approach reduces all of the highest correlations among the new set of aid variables to a level which should eliminate patterns of pairs of positive/negative coefficients. Second, we could continue to use the original set of aid variables but interpret the resulting estimates of effects in terms of the sum of the two coefficients for each pair of highly correlated variables. We chose to use the second approach, for it provides all of the information obtainable from the first approach and, additionally, offers some evidence of the relative effects of formula/capitation grants vis-a-vis loan/scholarship funds. The drawback of the second approach is that the relatively high frequency of negative coefficients in statistical tables, if taken out of context, may cause some of the users of our results to draw mistaken conclusions about the effectiveness of federal support for nursing education.

*To test this conclusion, we estimated models which contained only one of the two variables in each pair (i.e., we estimated the model once with only variables for formula/cpaitation grants included and once with only variables for loan/scholarship funds). In the majority of cases, the same sign was obtained for the separately estimated coefficients of both elements of each pair (positive in about three-quarters of the 61 cases).

Table 8 presents our estimates of the impact of NTA funding in a revised format, one that should allow easier interpretation than the format of Tables 4 through 6. For diploma programs before 1970 and for all programs after 1971 the estimated effects of formula/capitation grants and loan/scholarship funds have been added together.* For associate and baccalaureate programs before 1972 and for diploma programs in 1970 and 1971, the results indicate the effects of loan/scholarship funds alone (no formula/capitation grants were provided in those program-year combinations).

Of the three sets of results presented in Table 8, those that pertain to admissions are the most consistent and persuasive. Our inferences about the relationships between NTA funding and nursing school admissions are the following:

- Estimates of the combined effects of formula/capitation grants and loan/scholarship funds on admissions are virtually always positive (20 of 21 cases) and are usually statistically significant (14 of 21 cases).
- The magnitide of the estimates of combined effects on admissions are of a reasonable magnitude. Increases of between one and 16 admissions per school per year are implied to result from receipt of both types of financial assistance. These are estimates of average effects across schools and years.
- Because of differences in the relative number of students whose behavior might be affected, one would expect the combined effects of formula/capitation grants and loan/scholarship funds to be larger for large schools than for small schools. Estimates of combined effects are always larger for medium-size

*Standard errors for sums of two coefficients are calculated as the square root of the sum of the variances for each of the two coefficients and two times the covariance of the two coefficients. The years to which specific estimates of effects apply is somewhat cumbersome to explain. For admission models, results pertain to the years indicated in the tabs of Table 8, with the exception of the period 1965-1969. In that period, the results pertain to 1968 and 1969 for associate programs and to 1969 only for the other two types of programs. Because of the use of lagged variables to represent NTA funding in attrition and graduation models, estimated effects apply to the years indicated plus some subsequent years as well.

TABLE 8

ESTIMATED EFFECTS OF NTA FUNDING PER PROGRAM
PER YEAR BY SIZE AND TYPE OF PROGRAM[1]
(Number of Students)

	Admissions: Diploma			Admissions: Associate			Admissions: Baccalaurate		
	Small	Medium	Large	Small	Medium	Large	Small	Medium	Large
1965-1969[2]	4.1*	6.6*	1.3	4.5	—	—	6.2	8.7	32.2
1970-1971[3]	3.3*	2.6	0.6	—	—	—	—	11.4	28.0
1972-1975[4]	2.8*	5.5*	7.6*	1.1	3.2*	—	1.6	12.2*	5.0
1976-1979[4]	3.6*	8.6*	15.6*	3.6*	5.4*	19.0*	1.8	9.5*	6.8
Construction	—	11.6	3.0	—	23.8*	10.7	0.5	0.8	3.0

	Attritions: Diploma			Attritions: Associate			Attritions: Baccalaurate		
	Small	Medium	Large	Small	Medium	Large	Small	Medium	Large
1965-1969[2]	0.8	1.1*	-1.8*	-0.01	-6.3*	7.3	4.2*	-5.8	13.9*
1970-1971[3]	1.2	1.4*	-3.2	0.2	-1.4	9.4*	1.0	-6.5	7.1
1972-1975[4]	2.5*	1.5*	-1.0	-0.7	-0.1	-3.9	-1.3	1.8	-1.6
1976-1979[4]	1.6*	-0.3	1.5	0.4	-0.01	2.2	5.1*	5.3	3.2
Construction	0.2	4.8*	1.4	-0.5	4.9*	9.2*	0.4	-4.6	3.8

	Graduations: Diploma			Graduations: Associate			Graduations: Baccalaurate		
	Small	Medium	Large	Small	Medium	Large	Small	Medium	Large
1965-1969[2]	—	0.2	0.3	1.6	1.5	—	1.3	3.7*	0.6
1970-1971[3]	—	0.6	—	0.6	0.6	—	0.2	7.8*	—
1972-1975[4]	—	2.0*	3.9*	1.4*	1.3	—	—	2.0	—
1976-1979[4]	—	2.6*	4.8*	1.5*	1.7*	4.2*	—	4.8*	—
Construction	—	2.5*	7.4*	0.3	3.5	0.3	1.3*	2.6	7.4*

[1]For admissions and graduations where entries would have indicated a negative effect of NTA funding, the table cells are blank (—). This protocol relfects our maintained hypothesis of nonnegative results.

[2]Combined effects of formula grants and loans/scholarships for diploma programs; effects of loans/scholarships only for other types of programs.

[3]Effects of loans/scholarships.

[4]Combined effects of capitation grants and loans/scholarships for all types of programs.

*Statistically significant at 95-percent confidence level.

schools than for small schools, but the same type of difference in estimates is not so consistent between medium-size and large schools.

- Estimates of combined effects on admissions are larger for each successive legislative cycle. This trend probably reflects increases in impact due to increases in program enrollment over time (large number of students whose behavior might be affected) rather than increases due to higher leverage of NTA funding.*

- For those program-year combinations for which formula/capitation grants were not available, estimated effects of loan/scholarship funds on admissions are virtually always positive for diploma and baccalaureate programs (eight of nine cases) but are seldom statistically significant (two of nine cases). For associate programs, the corresponding estimates are virtually never positive (only one of six cases).

- For baccalaureate programs, the estimated effects of loan/scholarship funds on admissions prior to 1972 (i.e., not in combination with capitation grants) are quite large. Increases of between 6 and 32 admissions per school per year are implied to result from receipt of loan/scholarship funds during this period. For diploma programs, the corresponding estimates (1970-71 only) are small--increases three or fewer admissions per school per year.

- Estimates of the effects of construction grants on admissions are almost always positive (seven of nine cases) but rarely statistically significant (only one of nine cases). The magnitudes of the estimated effects are quite variable (increments of 0.5 to 24 admissions per school per year) and do not exhibit the expected pattern of differences across programs of different size.

Our overall interpretation is that evidence of a positive relationship between NTA funding is quite strong--particularly when formula/capitation grants and loan/scholarship funds were received in combination.

---

* Our calculations indicate that NTA funding (in current dollars) per student enrolled remained relatively constant between 1968 and 1971, increased substantially in 1972, started to decline in 1975, and had fallen to about 1968-levels by 1979. Discounted for inflation, aid per student enrolled in 1979 was well below the 1968-levels. These are approximate data.

Results from attrition models are consistent with either of two interpretations: (1) NTA funding is associated with slightly higher attrition rates, but the relationship is so weak that it is difficult to detect and verify with statistical models; or (2) there is no relationship between NTA funding and number of attritions, and the pattern of the results obtained are due entirely to chance. The first interpretation is supported by several aspects of the results in Table 8:

- Regression results indicate a positive relationship almost twice as frequently as they indicate a negative relationship (28 positive estimates versus 17 negative estimates);
- Positive estimates are statistically significant six times more frequently than one would expect as the result of chance;*
- Results for attritions show some consistency with results for admissions: when loan/scholarship funds alone were received (e.g., 1970-71), the implied effects are mixed (about evenly split between positive and negative); for formula/capitation grants and loan/scholarship funds in combination, however, a large majority of the estimated effects are positive.** This pattern is found in results for both admissions and attritions.
- The magnitudes of effects implied by the numerical values in Table 8 are quite small (changes of three or fewer attritions per school per year in 27 out of 45 cases) and the power of statistical tests to detect such small effects is quite low.***

---

* If there is no relationship between two variables and one conducts 45 independent tests with a 95-percent confidence criterion, the results should indicate the existence of a relationship in fewer than three of the 45 trial as the result of chance. Twelve of the positive estimates for attritions in Table 8 are statistically significant, while only two of the negative esimates are significant. Not all of our tests are independent.

** Recall that the basis for arguing that NTA funding might increase attritions is that the frequentcy of drop-outs might be above average for the additional students induced to enter nursing schools as the result of federal aid. One would expect, therefore, positive estimates for effects on attritions to be matched by positive estimates for effects on admissions.

***Statistical power decreases as the size of the effect decreases. If effects of NTA funding on attritions are small in magnitude, then one would expect a low percentage of regression coefficients to be statistically significant.

A second possible interpretation of the results from attrition models--that there is no relationship between attritions and federal aid--is also supported by some aspects of the results in Table 8:

- Even though positive estimates occur more frequently than negative estimates, the relative frequency is within the limits of chance.*
- The pattern of estimated effects exhibits no real consistency. The table of results from attrition models contains at least one negative estimate in every row and, with one exception, in every column. The magnitude of effects is no larger for large schools than for small schools and, like the results for admissions, show no consistent trend across legislative cycles.
- Although there is an unusually high frequency of estimates which are both positive and statistically significant, there does not appear to be any plausible pattern in their occurence.

We find the evidence for each of the competing interpretations about equally persuasive and offer no judgement at this point as to which of the two viewpoints is correct.

The results for graduations are at least as ambiguous as the results for attritions. From the information in Table 8 one can make about equally persuasive cases for two interpretations: (1) no relationship between NTA funding and number of nursing school graduates; or (2) a weak positive relationship that is difficult to detect and verify.

- Estimated effects are positive twice as often (31 cases) as negative (14 cases) values.
- The frequency of estimates that are both positive and statistically significant (fifteen cases) is much higher than is likely to be due to chance.**

---

* If no systematic relationship exists between NTA funding and attritions, one would expect about one half of regression coefficients to be positive and the other half to be negative. A two-to-one split could occur by chance, however, and the likelihood (about an eight percent chance) of so disproportionate a split is not so high that one's confidence that there is no relationship should be shaken.

**On average, across repeated trials with 45 independent tests, one would expect fewer than three instances of statistically significant estimates as the result of chance. It is important to remember that not all of our 45 tests are independent.

- The implied magnitudes of effects are relatively small (22 of the 31 positive estimates for graduations in Table 8 are 3.0 or lower), and one would expect few tests to be statistically significant when effects are small.

- There are no consistent differences in the magnitudes of effects across programs of different size and no discernable trend in magnitudes of effects across legislative cycles.

The pattern of results for attritions and graduations are certainly less persuasive than the pattern of results for admissions. We return to this comparison of patterns of results across the three outcome variables in the discussion below. First, however, it is important to interject a clarification which may assist in the interpretation of the magnitudes of estimated effects.

The numerical values presented in Table 8 require very careful interpretation if they are to be used to compare implied magnitudes of effects across the three outcome variables. The numerical values reported for admissions may be interpreted in a straightforward fashion. They indicate the increases in admissions which are predicted to occur per school per year for each year a school receives particular types of federal aid. In models for attritions and graduations, federal aid is represented by variables which count the number of times a school has received funding in the last two (associate programs) or three (diploma and baccalaureate programs) academic years. This formulation for aid variables complicates interpretation of the regression coefficients obtained, for the effects of receipt of aid are spread across a two of three year period. The numerical values reported for attritions and graduations measure effects for a single year. Cumulative effects, however, are two or three times larger than the numerical values indicate.

A specific example, based on numbers from Table 8, will illustrate the potential pitfalls in comparing estimates of effects across the three outcome variables. Consider the class of nursing students which entered small associate programs in the fall of 1976. Our results indicate that the combined effect of a capitation grant and loan/scholarship funds would be an increase in admissions by about three and one half students, on average, per school (3.6 from Table 8). According to our attrition model, the same funding, in summer of 1976, would have caused attritions to increase by about one half student, on average, per school (0.4 from Table 8) in both the 1976/77 and 1977/78 academic years. If both types of funding were again received in the summer of 1977, an additional one half student, on average, per school (0.4) would be lost in the 1977/78 academic year. An increase in admissions of 3.6 students and an increase in attritions of 1.2 students (3 x .04) seems to convert to a net gain of about two and one half students, on average, per school (3.6 - 1.2 = 2.4) at graduation time, summer of 1978. Our graduation model predicts that the number of graduates will have increased by about three students (2 x 1.5) as a result of the school's receiving aid in two consecutive years. At least a modest inconsistency seems to exist among the results predicted by our three models.

A partial explanation for the seeming inconsistency is found by clarification of the definition used as a basis for measuring attritions. We have defined attritions as the change in total enrollment from one year to the next that is not due to admissions or graduations. Because this definition was used to compile our data on attritions, the one student that was lost during the 1976/77 academic year could have come from the class entering in the fall of 1975 or from the class entering in the fall of 1976 (the class

we have followed). Similarly, the one student lost during the 1977/78 year could have come from either of two entering classes--fall of 1976 or fall of 1977.

This illustration serves to establish two fundamental points about the numerical values in Table 8. First, the values reported for attritions and graduations do not indicate the cumulative effects of aid on attritions and graduations; instead they represent the effects that will occur in a single year. Second, one cannot subtract the estimated effect on attritions from the estimated effect on admissions and expect the result to equal the estimated effect on graduations, for the three outcome variables measure different cohorts of students. Another caveat should be added: since the three models have been estimated independently of one another, there is no guarantee that the estimated results will conform to a simple accounting identity among the three outcome variables. Random influences, measurement errors in our variables, and imprecise specification of the three models are bound to cause some deviations from algebrically consistent results.

To this point we have discussed each of our three sets of results--for admissions, attritions and graduations--relatively independently of each other. On the basis of the discussion thus far, it would seem reasonable to conclude that NTA funding caused nursing school admissions to rise but caused little or no changes in attritions and graduations. We intend to demonstrate below that a different set of conclusions emerge when the statistical results are examined in a broader fashion and when the potential effects of various statistical and methodological problems are considered. We hope to establish two points in particular: (1) that the effects of NTA funding on number of nursing school graduates are likely to be larger than statistical results seems to imply; and (2) that the significant effects found for admissions are likely also to understate the actual impact of federal aid.

When the results obtained for each of the three outcome variables are compared, a fundamental inconsistency emerges. It simply cannot be true that federal aid has induced a significant number of additional students to enter nursing programs without also causing some corresponding changes in the number of students exiting nursing schools by either of the two possible routes--attritions or graduations. Since the evidence of an increase in admissions is quite convincing, there must be some flaw in the analysis of either attritions or graduations, or both.

Although various statistical and methodological problems are likely to have affected our analyses of both attritions and graduations, inaccuracies in the analysis of attritions are not likely to be the cause of the inconsistency in our results. As a basis for illustrating this point, let us assume that of every 10,000 students admitted to nursing schools, 1000 have been induced to attend as the result of federal aid. There appears to be no basis for believing that NTA funding would increase the attrition rate among the 9000 students whose decisions to enter nursing programs were not affected by federal aid. In fact, if NTA funding had any affect on the attrition rate for this group, the effect should have been a reduction in attritions (and a resulting increase in graduations). For the other, 1000 entrants, one can present a variety of reasons why attritions might be above average (e.g., higher than average frequency of academic or financial problems). However, even if the attrition rate for the latter group is double the average rate of 30 percent,[37] graduations would still be higher by 400 students as the result of NTA funding. Furthermore, the hypothetical 600 additional attritions from among the 1000 additional entrants constitutes a 22 percent increase in attritions (600/2700 = 0.22)--an effect so large that it is very unlikely to have been missed by our statistical analysis.

Two insights can be drawn from the foregoing illustration; one concerning the implications of null findings in our analysis of the relationship between NTA funding and attritions and the other concerning the inconsistence among our three sets of findings. Both are quite important:

- Our statistical results provide strong evidence that the attrition rate among the additional students induce to attend nursing school as the result of federal aid is probably much lower and certainly no higher than the attrition rate among other nursing students. If one interprets the absence of a consistent pattern of positive and statistically significant regression coefficients for aid variables in our attrition models as evidence that there is no relationship between NTA funding and number of attritions, then the attrition rate among the additional entrants to nursing programs must be below the average for other students. In fact, data from a 1974 survey of nursing students indicates a lower attrition rate among students admitted with financial aid than among students admitted without external assistance.[38]

- There is no reasonable basis for believing that the absence of an estimated effect of NTA funding on graduation is due to a large underestimate of the effect of federal aid on attritions. For all of the estimated increase in admissions to be offset by a large (unestimated) increase in attritions, all of the additional entrants would have had to drop out before graduation. The required increase in attritions is too large to believable, is inconsistent with independent evidence (the survey results mentioned above), and is too large to have escaped detection in our statistical analysis.

The first of these points speaks to the effectiveness of federal aid to nursing schools, by indicating that the additional students attracted to nursing schools by federal are likely to be at least as successful as other students in completing their programs. The second point indicates that the only reasonable explanation for the apparent inconsistency between our findings with regard to admission and graduations must lie in the methodology we have used to analyze graduations.

In fact, there are two important methodological problems we could not resolve satisfactorily in designing our analysis of graduations. The first problem involves the potential confounding influences of the

substantial inflows and outflows of students due to quits and transfers. Had we been able to analyze each of these flows separately or been able to measure graduations for specific cohorts of students (e.g., those that entered in the fall of 1974), our results would have been easier to interpret and, possibly, more consistent across analyses. This point is borne out by the illustration we used to show the potential for inconsistencies across the three sets of results.

The second weakness in our analysis of graduations is probably the most important. The relationship betwen NTA funding and graduations is complicated substantially by the fact that lags are involved--graduations in one year depend upon reciept of aid not only in the current academic year but in the two, three or four previous years as well, depending on the length of the program. We mentioned in the previous section of this report, on evaluation design and model specification, that we have been able to incorporate this lag structure in our models for graduations (and attritions) in only a very approximate fashion, by including variables which count the number of times that aid was received in the relevant span of years for each school. This approach effectively gives equal weight to receipt of aid in each of the relevant years, whereas the actual relationship between aid and graduations may be one in which aid received in one year (e.g., the year most of the graduating class entered nursing school) is far more important than aid received in other years. To the extent that our representation of lag structures in models for graduations is misspecified, we should expect the models to provide a relatively weak basis for testing the effects of NTA funding on graduations. Since we do not need to represent lag structures in our models for admissions (assumed to depend upon receipt of aid in only the

current year), those models should provide a relatively stronger basis for detecting effects.

Table 9 presents detailed estimates, by type of program and by year, of the increases in admissions that, according to our models, are the result of formula/capitation grants, loan/scholarship funds, and construction grants. Between 1969 and 1979, a total increase of about 46,900 admissions are shown across the three types of programs. At an aggregate level, our models for admission and graduations produce the following results:

Type of Program	Predicted Increase in Admissions, 1969-79*	Predicted Increase in Graduations, 1969-79*
Diploma	16,521	14,511
Associate	14,173	3,651
Baccalaureate	16,208	1,659
Total	46,902	19,821

Reflecting the relative pattern of results in Table 8 above, the total estimated increase in graduations is only forty percent of the total estimated increase in admissions.

On the basis of the argument we have developed, we believe that the impact of federal aid on graduations should be much closer to the estimated impact for admissions than our statistical results actually indicate. If the attrition rate for additional entrants (due to NTA funding) is equal to the attrition rate for other students (30 percent), then the increase in graduations due to federal aid should be considerably higher than our

*These figures are the sum of estimates of impact produced by the models shown in Table 4 through 6. See the footnotes in Table 9 for further discussion.

Table 9

ESTIMATED INCREASE IN NURSING SCHOOL ADMISSIONS DUE TO CAPITATION GRANTS, NTA LOANS/SCHOLARSHIPS, AND CONSTRUCTION GRANTS

(Comparison With Total Admissions For All Schools Receiving NTA Funds)

	DIPLOMA		ASSOCIATE		BACCALAUREATE		ALL PROGRAMS	
YEAR	Est. NTA Effect	Total Admissions	Est. NTA Effect	Total Admissions	Est. NTA Effect	Total Admissions	Est. NTA Effect	Total Admissions
1969	1,497	19,652	23	5,231	2,364	11,166	3,884	36,049
1970	723	17,263	0*	10,968	2,092	12,358	2,579**	40,589
1971	672	18,448	0*	19,486	2,267	16,537	2,568**	54,471
1972	1,754	23,579	0*	26,724	1,187	21,201	2,297**	71,504
1973	1,527	20,644	0*	26,762	1,179	21,750	2,283**	69,156
1974	1,284	17,773	0*	28,931	1,140	21,796	2,127**	68,500
1975	1,217	16,947	0*	31,299	1,234	22,106	2,165**	70,352
1976	2,137	17,069	3,941	34,553	1,139	23,039	7,217	74,661
1977	2,124	16,393	4,113	35,617	1,264	24,946	7,501	76,956
1978	2,067	14,763	4,294	35,950	1,309	25,442	7,670	76,155
1979	1,519	12,769	4,059	29,568	1,033	20,148	6,611	62,485
	16,521	195,260	14,173**	285,089	16,208	220,489	46,902	700,878

Source: Calculated from statistical models reported in Tables 4 through 6; all regression coefficients reported for NTA variables, regardless of sign (+ or -), have been used to derive the predictions reported here, with one exception indicated in the notes below.

* For years 1970 through 1975, the predicted impact of NTA funds on admissions is negative. Since we can find no plausible explanation for receipt of aid reducing admissions, we have replaced negative values by zeros. The negative values have been used, however, for calculation of row and column totals.

**These row and column totals cannot be derived by adding individual elements, due to the replacement of negative values for associate programs for 1970-75 with zeros.

graduation models predict.* Our analysis of attritions implies, however, that attrition rates are much lower for additional entrants (due to NTA funding) than for other students. If this result is correct, the increase in graduations should be almost twice as large as our graduation models predict. Based on the complete set of results and the interpretations we have recommended, the best estimates that can be drawn from our statistical results are the following:

- Between 1969 and 1979, NTA funding caused nursing school admissions to increase by about 46,900 new entrants;
- Adjusted for attrition, these new entrants will result in an increase in number of nursing school graduates of between 32,800 (30% attrition) and 42,200 students (10% attrition);
- If NTA funding has had any effect on the attrition rate in nursing schools, a slight decrease is the most like effect to have occurred;**
- Among the new entrants with federal aid, the attrition rate is certainly no higher than, and is probably much lower than, the attrition rate for other students.

These estimates are only as good as the statistical models upon which they are based. As we are about to indicate, there are several important reasons to believe that our statistical models provide underestimates of the effects of NTA funding on admissions and graduations. In addition, we have not considered at all the impact of NTA funding on the quality of nursing education. We therefore believe that the estimates of quantitative impact shown above significantly understate the true impact of the financial support provided to nursing schools under NTA legislation.

---

* Because increases in admissions in one year translate into increases in graduations in later years, it is not correct to multiply the change in admissions for 1969-79 by an attrition rate and use the result to predict the change in graduations for the same period.

**Even if the attrition rate for additional entrants (due to NTA funding) is much lower than the attrition rate for other students, the overall attrition rate will decline only slightly--because the additional entrants are only a fraction of total entrants.

We mentioned, at the outset of this report, the most important reason to believe that our quantitative estimates understate the true impact of federal support for nursing education. We cannot estimate the total effect of NTA funding because we are measuring only one aspect (increased enrollments) of the total set of objectives that NTA legislation sought to achieve. The effects of federal programs on the quality of nursing education, on minority recruitment, and on advanced nurse training have not been included in our study.* For our results not to be used incorrectly, it is essential that these important omissions be kept in mind.

An important reason to believe that our statistical results underestimate the effects of NTA funding is that we have included in our calculations only a portion of the total change in enrollment that occurred over the period of time to which our study pertained. Table 10 indicates that a substantial percentage of the change in nursing school enrollments between 1969 and 1979 resulted from closure of diploma schools and opening of associate and baccalaureate programs. We could not devise a statistical methodology which could be used to predict the degree to which the availability of NTA funding affected openings and closures. We have ignored, therefore, a potentially large effect of federal aid on the overall change in admissions and graduations, and our estimates are likely to be too low as a result.

A third problem with our methodology is that we have estimated the effects of receipt of NTA funding by comparing schools and years in which NTA funding was received to schools and years in which NTA funding was absent but a substantial amount of other federal assistance to students was available.

---

*We also excluded from our analysis the effects of various categories of NTA funding (Special Project Grants, for example) due to limitations of data or for methodological reasons.

Table 10

CHANGES IN ENROLLMENT DUE TO CLOSURE, STARTUP OF NEW PROGRAMS AND YEAR-TO-YEAR VARIATIONS AT CONTINUING PROGRAMS
(Number of Students Enrolled)

	CHANGE IN ENROLLMENT FROM PREVIOUS TO CURRENT YEAR									
	DIPLOMA PROGRAMS			ASSOCIATE PROGRAMS			BACCALAUREATE PROGRAMS			
YEAR	Closed Programs	New Programs	Continuing Programs	Closed Programs	New Programs	Continuing Programs	Closed Programs	New Programs	Continuing Programs	NET CHANGE
1969	-929	106	-4,149	---	3,116	4,378	-32	621	1,177	4,282
1970	-1,357	233	-505	-174	2,573	7,994	---	1,139	9,936	19,839
1971	-1,564	---	1,861	-100	2,406	9,382	-22	908	11,136	24,007
1972	-1,239	24	1,531	-137	2,792	8,673	-44	1,038	14,687	27,325
1973	-2,027	22	-1,013	-481	3,081	8,586	-31	1,668	11,134	20,939
1974	-1,178	---	-3,462	-342	1,870	5,492	-581	1,244	9,199	12,242
1975	-1,663	---	-2,335	-275	1,200	3,666	-22	1,381	5,449	7,401
1976	-2,087	198	-2,154	-910	1,779	1,552	-1,902	3,167	57	-300
1977	-1,005	---	-2,179	-152	963	-981	-22	865	2,609	98
1978	-1,032	---	-3,757	-199	955	-87	-200	411	1,067	-2,842
1979	-546	---	-3,987	-635	605	421	-2,199	818	-3,220	-8,743
TOTAL	-14,627	577	-20,149	-3,405	21,340	49,076	-5,055	13,260	63,231	104,248

NOTES: For closed programs, figures indicate total enrollments in the previous year for programs which shut down between the previous and the current (row tab) year. Since this enrollment usually consists of the last graduating class of the program, the students are not "lost" to the nursing profession for they usually graduate. Educational capacity is lost, however; the amount of capacity lost by closure is probably much understated by the numbers in the "closed programs" column (usually only the size of one class shown). Similarly, figures in the "new program" column greatly understate the additional capacity gained by the opening of new programs, for the figures reflect enrollment of only the initial freshman classes at new schools (positions for second-, third- and fourth-year students not reflected). The changes in enrollments in the "continuing programs" column are largely the changes which are reflected in the data set we have used to analyze the impact of NTA funding. Even some of these changes are not reflected, however, because we screen out observations for new programs until the year of their second graduating class. The information presented in the table reflects changes in enrollments for a "screened" data set (i.e., some school years eliminated due to questionable data for any one of numerous variables). The information will, therefore, not correspond precisely to published data for the U.S. Since enrollments for the schools included in the data set at the start of the period was 150,314 students, entries in the "net change" column imply an ending enrollment of 254,562--both figures reasonably close to published totals.

From 1968 to 1972, to 1976 appropriations for student aid programs for higher education by federal and state governments grew from $480 million to $1176 million, to $3598 million.[38] Available to at least those nursing students who were enrolled in associate and baccalaureate programs, these non-NTA funds are likely to have increased admissions and graduations across a large percentage of the school-years in our data set and thereby inflated the baseline against which the effects of NTA funding are measured. Although we have often used the phrase "effects of federal aid" throughout this report, our statistical models are capable of estimating the effects of only that portion of federal aid that was provided under the authority of NTA legislation, and the results indicate the marginal impact of a relatively small program of assistance against a baseline of a set of relatively massive programs of other governmental assistance.

The confounding effects of other federal and state programs of educational assistance become a major problem when one attempts to use our results to project into the future. Because other programs of government assistance were large and increasing during the period 1969 to 1979, one would expect estimates of the marginal effect of NTA funding during that period to be relatively small. General programs of federal aid to college students are now being drastically reduced, however. As federal support for nursing education under the authority of NTA-type legislation continues in the 1980s, one should expect the future effects to be much larger than the historical impact from 1969 to 1979. As other programs of student assistance decline, the leverage of NTA funds should significantly increase.

3.3 Implications of Statistical Results

The majority of the statistical results generated by this project have now been reviewed. A few ancillary analyses were performed to address certain specific research questions. A summary of the results discussed to this point, along with the evidence obtained from ancillary analyses, is presented below in the format of answers to the specific research questions posed earlier in this report.

(1) Did NTA funding increase the number of graduations from schools between 1965 and 1979 and, if so, by how much?

We believe that our statistical results provide strong evidence that graduations did increase as a result of the financial support provided to nursing schools under the authority of the NTA legislation. On the basis of our statistical models alone, we have calculated an increase in graduations due to NTA funding of between 36,500 and 47,000 students. For several reasons, however, these figures understate the actual impact of NTA funding on nursing graduations:

- For methodological reasons, our estimates apply only to a part of the period since NTA funding began. Increases in graduations for the late-1960s and the early-1970s are not reflected in our estimates.

- Our estimates do not reflect the potentially significant impact NTA funding might have had on number of graduates by influencing the number of nursing programs in existence in any given year. To the extent that federal aid slowed the rate of closure of diploma programs and/or increased the rate of startup of associate and baccalaureate programs, the actual increase in graduations due to NTA funding is larger than our estimates indicate.

- The time period to which our estimates apply is one in which general programs of governmental assistance for higher education and postsecondary students were massive. To the extent that appropriations under these general programs are substantially reduced during the remainder of the 1980s, the future impact of NTA funding is likely to be much larger than was the case in the past.

We offer no subjective judgement of the size of the underestimate inherent in the results obtained from our statistical models, for such speculation is not necessary to establish the impressiveness of the increase in graduations that has been produced. As we discussed earlier, the Surgeon General's Consultant Group on Nursing projected in 1964 that by 1970 there would be a shortage of 200,000 nurses in the U.S. This estimated shortage provides a useful perspective for assessing the size of effect that our statistical models produce. The estimated effect we have calculated represents an impact of 16 to 21 percent when measured against the size of what was considered a very large shortage. This comparison establishes a fundamental point: It is unrealistic to expect federal support for nursing education to produce massive changes in the size of the nursing workforce in a short period of time, but over the period of a decade, the impact of even the modest level of assistance actually provided under NTA legislation had a very appreciable effect. We believe that this point is the fundamental conclusion of our research.

(2) How did the effects of aid on graduations occur--by means of a change in the number of admissions, as the result of a change in retention rates, or as a consequence of a combination of both types of changes?

Our results indicate that the increase in graduations results from two simultaneous changes, an increase in number of admissions and a small but important increase in retention rates. On the basis of our statistical models, we have calculated an increase in admissions due to NTA funding of about 46,900 additional students. This estimate, of course, is likely to understate the actual impact of NTA funding for all of the same reasons that our estimate of increased graduations is likely to be too low. Our statistical models indicate the absence of any strong relationship between NTA

funding and number of attritions. Since the number of students in nursing schools has increased without any significant increase in the number of attritions, there is evidence that attrition rates are lower (retention rates higher) among students induced to enter nursing schools as the result of federal aid than among the other members of each entering class.

The magnitude of the effect of NTA funding on admissions cannot be adequately assessed by comparing the estimated increase in admissions to the total number of students who have entered nursing programs. Our estimated increase--46,900 extra admissions--constitutes 6.7 percent of total admissions at those nursing schools which received NTA funds. In isolation, a 6.7 percent impact appears to be small. Other research has indicated, however, that the increase in admissions, across all higher education programs, as the result of general programs of student aid constitute only about 3.2 percent of total admissions.[40] Keep in mind that our estimates of the impact of NTA funding measure only incremental effects over and above the impact of general programs of student aid. Despite the fact that it represents only an incremental effect, our measure of 6.7 percent for NTA funding is more than twice as large as the 3.2 percent impact of general student aid. Apparently, the specialized assistance (for nurses only) provided under the authority of NTA legislation has greater leverage on the decisions of students than more general forms of government assistance to higher education.

(3) Did federal aid have similar or different effects across the three different types of basic nursing-education programs--diploma, associate, and baccalaureate?

The evidence of differential effects across programs is relatively weak. The increase in admissions due to NTA funding, as a percentage of total admissions, is highest for diploma programs, possibly reflecting the

very limited access of students in diploma (nondegree) programs to general federal and state aid for postsecondary education. Formula/capitation grants and loan/scholarship funds, when received in combination, had about the same magnitude of effects across the three types of programs, but loan/scholarship funds alone show the largest estimated effects for baccalaureate programs (for which educational costs and foregone wages are highest).* Our admissions models indicate, as one would expect, that NTA funding had larger absolute effects for large-size programs than for small-size programs. Converted to measures of percentage change in admissions, our results provide no evidence of differences in the leverage of NTA funds across programs of different size.

(4) Did different types of NTA funding--construction grants, capitation, loans and scholarships--have differential effects on the number of nursing students?

Our statistical models are not powerful enough to provide solid evidence of the relative impacts of different types of funding. The number of schools receiving construction grants, for example, is too small for estimates of the effects of this type of assistance to be very precise. Furthermore, a high degree of overlap between the schools receiving formula/capitation grants and the schools receiving loan/scholarship funds greatly reduces the power of the statistical models to isolate the independent effects of aid to institutions and aid to students. For these reasons, we have only very tentative judgements to offer:

---

*These estimates apply to years prior to 1972; the large general programs of federal aid to higher education increased dramatically after 1972. We could not obtain reliable measures of the independent effects of loan/scholarship funds for baccalaureate programs after 1972 (confounded with effects of capitation grants).

- Construction grants are associated with increased enrollments not only in the academic year in which they are received but in subsequent years as well. The evidence indicates that the additional capacity created/upgraded by construction grants was subsequently utilized in some degree.* Because these grants were provided to relatively few schools, they cannot be credited with more than a a modest fraction of the overall increase in enrollments due to NTA funding.

- It is virtually impossible to disentangle the effects of formula/capitation grants from the effects of loan/scholarship funds, but the pattern of results obtained tends to support the judgement that formula/capitation grants were the more effective of the two types of assistance.** If this judgement is correct, it may reflect the fact that other government programs were in place to provide aid to students, and that NTA loans/scholarships therefore had a relatively small incremental effect.

We were not able to evaluate the effects of other types of NTA funding--special project grants, traineeships, financial distress grants, etc.

(5) Did NTA funding have differential effects across states with different ratios of nurses to population?

To address this question, we performed some ancillary analyses, not included among the results discussed above. Having tested and evaluated our models for three outcomes--admissions, attritions and graduations--and having found the admission models to yield the most reliable set of results, we limited our study of differential effectiveness of aid across states to relative effects of NTA funding on admissions. Table A-5, in the appendix, presents the detailed results of this ancillary study.

---

* We were unable to evaluate the degree of utilization due to limitations of available data.

**Among the eligibility criteria for capitation grants, schools were required to provide reasonable assurances that admissions and/or enrollments would not decline from the previous year's level. Concerned that this program guideline might be responsible for our finding of a positive association between admissions and receipt of capitation grants, we performed a relatively simple analysis, of the frequency of decreases in admissions for programs receiving and not receiving capitation grants (see Table A-4 in the appendix). The results indicate no major differences in the frequency of decreases between the two categories of programs. We are confident, therefore, that the estimated effects of capitation grants are not the result of program rules.

Our ancillary analysis provides no evidence of a differential in the effectiveness of NTA funding across states with different ratios of nurses to population.* It appears that both students and schools respond to the availability of NTA funding in the same fashion regardless of the relative availability of nurses in the state in which they are located. The policy implication is clear. If reductions in regional shortages of nurses is to be a policy goal for the future,** an advantage can be gained by channeling a disproportionate share of federal aid to underserved areas. Our results indicate that the same increase in admissions (and, presumably, graduations) is obtained for a given amount of NTA funding, regardless of its regional allocation. No special leverage is gained, however, in terms of larger increases for a given amount of funding. The increase in impact in one area will be approximately offset by a reduction in impact in another area.

(6) Did the distribution of aid vary systematically—by type of program, size of program, or nurse-to-population ratio?

This is another research question for which ancillary analysis was required. We started by examining simple descriptive statistics on the relative frequency of receipt of aid by type of program, size of program, geographic area, and other potential correlates of allocation (see Table A-6

---

* Of 62 tests for differentials in effects, only ten of the estimated differences are statistically significant--half of them positive estimates (greater impact in states with low RN/population ratios) and the other half are negative. The full set of estimates are split relatively evenly between positive values (27 cases) and negative values (35 cases) and exhibit no explainable pattern across types and sizes of programs and across different types of aid variables.

**To date, federal policy has been to support nursing education on a national basis rather than on a selective regional basis. Since mobility of the nursing workforce is relatively high, it is likely that the national rather than regional focus will continue.

in the appendix as an example). Because these data reflected differences in relative frequencies across only one potential correlate at a time, we choose to use multiple regression as an analytic technique.* For each of the three types of programs, we estimated models designed to predict whether or not a particular school received NTA funding in a particular year. The models were estimated separately for loan/scholarship funds and for formula/capitation grants.**

Our statistical results indicate that the distribution of NTA funding did vary systematically, and some of the variations have potentially useful implications for future decisions with regard to administration of NTA funds:

- The most important correlate of receipt/nonreceipt of NTA funds is program size. Large programs received funds with a much higher frequency than small programs, and this pattern is as strong for loan/scholarship funds as for formula/capitation grants. To increase the distribution of federal aid in the future, the largest gains will be realized by encouraging applications for funding from smaller than average programs. Apparently the large amounts of money involved are sufficient incentive for applications from large schools.

- The frequency of receipt of NTA funds is lowest for diploma programs and highest for baccalaureate programs. This pattern is observed for both loan/scholarship funds and formula/capitation grants. Diploma programs therefore may constitute an attractive target for outreach programs aimed at both schools and students.

- The evidence indicates a higher frequency of receipt of NTA funds among schools located in areas with low nurse-to-population ratios. This result indicates that the pattern of distribution of federal aid has worked to reduce regional inequalities in the distribution of nurses, if only to a moderate degree.

---

* It did not seem necessary to resort to logit or probit estimation techniques to accomplish our relatively simple objectives.

**Years in which these latter grants were not authorized were excluded from the data set.

- Nursing schools in some states (e.g., Georgia, South Carolina, Nevada, and Virginia)* received NTA funds with much lower than average frequency. Although some of these differences are due to regional differences in the mix of programs by size and type, some state-to-state differences in frequency of receipt of aid are unexplained by the potential causal factors we have included in our models.** An examination of the previous pattern of distribution may suggest particular actions which would reduce regional differences in the rate of application for funds in the future.

We pointed out much earlier in this report that the distribution of aid is the result of a combination of factors--legislative stipulation of eligibility requirements, guidelines used by federal administrators, and decisions by schools to apply or not apply for funds. Our analysis points to no specific barriers to school's participating in NTA programs. Since the programs have been shown to be quite effective in stimulating nursing school enrollments, however, it is particularly important to be sure that no unintended barriers to participation actually exist.

---

* See Table A-6 in the appendix. The four states mentioned here have much lower than average ratios of RNs to population.

**See the continuation page for Table A-7 in the appendix for state-to-state differences not explained by other factors.

FOOTNOTES

FOOTNOTES

1. US Public Health Service, Toward Quality in Nursing: Needs and Goals, Report of the Surgeon General's Consultant Group on Nursing (Washington, DC: Government Printing Office 1963).

2. Division of Health Professions Analysis, The Shortage of Nursing Personnel --A New Look at the Issues (Hyattsville, MD: Health Resources Administration, January 12, 1981), pp. ix-xi.

3. The estimate of employment is from Robert Deane, Simulating an Econometric Model of the Market for Nurses (Ph.D. dissertation, University of California, Los Angeles), 1971, p. 266. The size of the nursing population is estimated by using an estimate of the labor force participation rate from John Edgren, "The Nursing 'Shortage' and the Nurse Training Act: Should the Federal Government by Paying for the Education of Nurses?" Mimeographed (Ann Arbor: University of Michigan School of Public Health Discussion Paper No. A12, September 1976), p. 5.

4. Estimated from data in Robert Dean, op. cit., pp. 264-6.

5. US Public Health Service, op. cit.

6. Donald E. Yett, An Economic Analysis of the Nurse Shortage (Lexington, MA: D.C. Health and Co., 1975), p. 160.

7. Ibid., pp. 136-7.

8. American Nursing Association, 1966 Inventory of Registered Nurses (Kansas City: American Nurses Association, N.D.).

9. Yett, op. cit., p. 1. See chapter 1 of this source for a well-documented summary of the evidence of a nursing shortage in the early 1960s.

10. Data are from the sources cited in footnote number 3 above and from American Nurses' Association, Facts About Nursing: 80-81 (New York: American Journal of Nursing, 1981). Estimate of nurses needed in 1975 is from US Public Health Service, Health Manpower Source Book (Washington, DC: Government Printing Office, 1974), p. 128.

11. Division of Health Professions Analysis, op. cit., pp. I-14 and I-16.

12. Yett, op. cit., p. 138.

13. Sources listed in footnote number 10 above. If the labor force participation rate had not increased from 1962 to 1975, the increase in employed nurses would have been lower by 22 percent. It should be noted that refresher courses for previously inactive nurses was a special focus at many schools during the 1960s.

14. American Nurses' Association, 1972 and 1977 Inventories of Registered Nurses (Kansas City: American Nurses Association, N.D.).

15. Data from various issues of ANA's Facts About Nursing.

16. N. Creason, Effects of External Funding on Instructional Components of BSN and Higher Degree Nursing Programs (New York: National League for Nursing), 1978.

17. Miller and Byrne, Inc., Evaluation of the Impact of PHS Programs on State Health Goals and Activities mimeographed (Washington, D.C.: U.S. DHHS, HRA, Office of Planning, Evaluation and Legislation, May, 1977).

18. Lawrence Johnson and Associates, Assessment of Recruitment and Retention Activities in the Health Resources Administration's Special Career Opportunity Grants and Special Project Awards, June 1977.

19. Stuart H. Altman, Present and Future Supply of Registered Nurses DHEW Publication No. (NIH) 72-134, November 1971.

20. Cresap, Paset and McCormack, Evaluation of the Nurse Training Act mimeographed (Washington, D.C.: U.S. DHHS, HRA, Bureau of Health Resoures Development, September 1974).

21. Yett, op. cit., pp. 248-61.

22. John Edgren, op. cit.

23. Division of Health Professions Analysis, op. cit., p. I-11.

24. The findings presented here are based on a review of more than a dozen studies: Gregory A. Jackson and George Weathersby, "Individual Demand for Higher Education," Journal of Higher Education 46 (November/December 1975), pp. 623-52.

25. This finding is based on the results of one study: R. Radner and L. Miller, Demand and Supply in US Higher Education (New York: McGraw-Hill, 1975).

26. Gregory A. Jackson, "Financial Aid and Student Enrollment," Journal of Higher Education, 49 (November/December 1978), pp. 548-74.

27. Ibid., pp. 571-2.

28. Patricia Nash, Student Selection and Retention in Nursing Schools DHEW Publication No. HRA 78-5, December 1977, p. 44. The data presented here are reconstructed from tables which provide percentage breakdowns; the counts of students presented here are approximations based on the reported percentages and totals.

29. Miller and Byrne, op. cit.

30. See Yett, op. cit., pp. 163-83.

31. Formula grants were available only to diploma programs (1965 to 1969); amounts allocated per student for capitation grants varied across programs. These and other differences in legislative provisions by type of program are best accounted for by estimation of seperate models by type of program.

32. J. Heckman, "Shadow Prices, Market Wages, and Labor Supply," Econometrica (July 1974), pp. 6791-94, and "Dummy Endogenous Variables in a Simultaneous Equation System," Econometrica (July 1978), pp. 931-60.

33. Cresap, et al., op. cit.

34. Patricia M. Nash, Entry Into Nursing, Part II, DHHS Publication No. HRA 80-3, March 1981, pp. 19-20.

35. Division of Health Professions Analysis, op. cit.

36. Both Altman op. cit. and Hixson, et al., op. cit. obtained much higher multiple correlation coefficients from their equations for admissions and graduations than were obtained in the analyses reported here. Because their data represents a pure time-series and ours represent a pooled time-series/cross-section, one would expect much higher predictive power for their analyses than for ours. The primary reason to be concerned about low predictive power is that it may reflect omission of one or more important explanatory variables—an omission which could bias results. Because of the absence of relative parallel previous studies for comparison of predictive power, the multiple correlation coefficients reported for our models provide little basis for assessment of potential specification bias.

37. Edgren, op. cit., p. 55. He reported the average attrition rate in 1973 at 30 percent. For the years between 1962 and 1973, his estimates of net attrition rates fluctuate between 30 and 37 percent. Gross attrition rates for individual entering cohorts should be higher (incoming transfers act as a partial offset).

38. Patricia Nash, Student Selection and Retention in Nursing Schools, p. 44. Of about 790 students entering without aid, about 101 (13%) withdrew during their first year; of 371 students entering with aid, about 36 (10%) similarly withdrew. Our estimates here are approximate, for Nash presents most of her data in percentage terms. Note several potential problems: (1) the sample is small, so estimates are unstable; (2) the data reflect withdrawls during only the first year; and (3) Nash's data indicate differences in attritions between those with aid and those without, rather than between those who entered only because aid was provided and those who would have entered in any case.

39. Larry L. Leslie, Higher Education Opportunity: A Decade of Progress (Washington, D.C.: American Association for Higher Education, 1977), p. 12; data exclude aid provided as part of Veteran's Benefits and Social Security Benefits.

40. Jackson, op. cit., p. 564. Jackson's data and statistical results indicate that receipt of aid increased admissions among students receiving aid by 8.5 percentage points (55 additional admissions out of 551 students admitted with aid). Among all college admissions represented in his sample (1710), about 3.2 percent (55/1710 = 0.032) can be attributed to receipt of aid.

APPENDIX A

MISCELLANEOUS STATISTICAL TABLES

Note: Tables A-1, A-2 and A-3 indicate means and standard deviations for variables before school-specific means have been subtracted. Transformed data (school-specific means subtracted) were used to derive the fixed-effects estimates shown in Tables 4 through 6 in the text.

Table A-1

MEANS ($\bar{X}$) AND STANDARD DEVIATIONS (s) FOR VARIABLES USED IN REGRESSION MODELS FOR DIPLOMA PROGRAMS

EXPLANATORY VARIABLES	SMALL PROGRAMS		MEDIUM PROGRAMS		LARGE PROGRAMS	
	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
NUMBER OF GRADUATIONS	22.7287	3.6570	34.7063	11.1906	61.0072	23.9631
NUMBER OF ADMISSIONS	32.0780	10.1537	49.6331	12.6999	86.7798	31.5646
NUMBER OF ATTRITIONS	8.5993	8.8308	13.3719	10.8171	23.4871	22.3663
FINANCIAL SUPPORT: PUBLIC	0.2686	0.4434	0.1127	0.3163	0.1296	0.3359
CONTROL: HOSPITAL	0.9876	0.1108	0.9737	0.1601	0.9610	0.1936
CONTROL: UNIVERSITY	0.0000	0.0000	0.0000	0.0000	0.0036	0.0599
CONTROL: JUNIOR COLLEGE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HOSPITAL BEDS PER CAPITA	3.0783	1.4209	7.8276	1.3444	7.7403	1.4770
HOSPITAL DAYS PER CAPITA	2.3711	0.4784	2.2688	0.4498	2.2252	0.4884
SALARIES: PUBLIC SCHOOL TEACHERS	11.4585	2.6435	12.1225	2.8290	12.0462	2.8225
POPULATION	8.6397	5.2469	8.3372	5.1341	8.2087	5.0183
POPULATION DENSITY	2.9539	5.6261	3.1669	4.1206	3.3034	9.6671
PHYSICIANS PER CAPITA	1.3423	0.3409	1.3553	0.3134	1.3563	0.3637
NURSING HOME BEDS PER CAPITA	4.6061	1.6310	5.2899	2.0186	5.5874	2.0663
HIGH SCHOOL GRADUATES	1.0904	0.6147	1.0735	0.6325	1.0733	0.6200
RN'S PER CAPITA	4.3208	1.0853	4.5012	1.0921	4.4028	1.1737
LPN'S PER CAPITA	1.7646	0.4192	1.8025	0.4877	1.8972	0.4964
YEAR 1969	0.1560	0.3630	0.1121	0.3156	0.1032	0.3043
YEAR 1970	0.1418	0.3490	0.1090	0.3117	0.1044	0.3058
YEAR 1971	0.1223	0.3278	0.1102	0.3132	0.1038	0.3051
YEAR 1972	0.1090	0.3118	0.1021	0.3028	0.1008	0.3011
YEAR 1973	0.0922	0.2894	0.0964	0.2953	0.0966	0.2955
YEAR 1974	0.0789	0.2697	0.0870	0.2820	0.0918	0.2888
YEAR 1975	0.0709	0.2568	0.0833	0.2764	0.0870	0.2819
YEAR 1976	0.0647	0.2461	0.0789	0.2697	0.0828	0.2756
YEAR 1977	0.0585	0.2348	0.0776	0.2677	0.0816	0.2738
YEAR 1978	0.0559	0.2297	0.0726	0.2596	0.0762	0.2654
YEAR 1979	0.0496	0.2173	0.0708	0.2565	0.0720	0.2585
For Admission Equations:						
FORMULA GRANTS 1965-69	0.0567	0.2314	0.0689	0.2533	0.0744	0.2625
CAPITATION 1972-75	0.0887	0.2844	0.1622	0.3687	0.2496	0.4329
CAPITATION 1976-79	0.0594	0.2365	0.1359	0.3428	0.1818	0.3858
LOANS/SCHOLARSHIPS 1965-69	0.0585	0.2348	0.0601	0.2378	0.0732	0.2605
LOANS/SCHOLARSHIPS 1970-71	0.1073	0.3096	0.1296	0.3360	0.1500	0.3571
LOANS/SCHOLARSHIPS 1972-75	0.1418	0.3490	0.2379	0.4260	0.2837	0.4509
LOANS/SCHOLARSHIPS 1976-79	0.1099	0.3129	0.2110	0.4082	0.2537	0.4353
CONSTRUCTION 1965-79	0.0301	0.1711	0.1033	0.3045	0.1152	0.3193
For Attrition/Graduation Equations:						
FORMULA GRANTS 1965-69	0.3094	0.7647	0.3882	0.8427	0.4397	0.8944
CAPITATION 1972-75	0.2234	0.5696	0.4615	0.8328	0.7193	1.0056
CAPITATION 1976-79	0.1356	0.3196	0.3100	0.7922	0.4253	0.9007
LOANS/SCHOLARSRIPS 1965-69	0.3174	0.7894	0.3519	0.8081	0.4145	0.8760
LOANS/SCHOLARSHIPS 1970-71	0.2881	0.6244	0.3795	0.7000	0.4535	0.7428
LOANS/SCHOLARSHIPS 1972-75	0.3803	0.8124	0.6775	1.0269	0.8194	1.0771
LOANS/SCHOLARSHIPS 1976-79	0.2349	0.7228	0.4721	0.9727	0.5609	1.0471
CONSTRUCTION 1965-79	0.0842	0.4867	0.3037	0.8996	0.3383	0.9442

A-1

Table A-1

MEANS ($\bar{X}$) AND STANDARD DEVIATIONS (s) FOR VARIABLES USED IN REGRESSION MODELS FOR DIPLOMA PROGRAMS (CONTINUED)

	SMALL PROGRAMS		MEDIUM PROGRAMS		LARGE PROGRAMS	
STATES	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
ALABAMA	0.0301	0.1711	0.0144	0.1192	0.0084	0.0913
ARIZONA	0.0000	0.0000	0.0000	0.0000	0.0006	0.0245
ARKANSAS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CALIFORNIA	0.0000	0.0000	0.0207	0.1423	0.0168	0.1285
COLORADO	0.0098	0.0983	0.0025	0.0500	0.0066	0.0810
CONNECTICUT	0.0213	0.1444	0.0244	0.1544	0.0228	0.1493
DELAWARE	0.0186	0.1352	0.0050	0.0706	0.0000	0.0000
DISTRICT OF COLUMBIA	0.0018	0.0421	0.0006	0.0250	0.0066	0.0810
FLORIDA	0.0000	0.0000	0.0019	0.0433	0.0078	0.0880
GEORGIA	0.0124	0.1108	0.0100	0.0996	0.0198	0.1393
IDAHO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ILLINOIS	0.0550	0.2280	0.1221	0.3275	0.0570	0.2319
INDIANA	0.0027	0.0515	0.0200	0.1402	0.0276	0.1639
IOWA	0.0239	0.1529	0.0200	0.1402	0.0372	0.1893
KANSAS	0.0381	0.1916	0.0069	0.0827	0.0156	0.1239
KENTUCKY	0.0133	0.1146	0.0038	0.0612	0.0066	0.0810
LOUISIANA	0.0071	0.0840	0.0069	0.0827	0.0132	0.1142
MAINE	0.0000	0.0000	0.0238	0.1525	0.0000	0.0000
MARYLAND	0.0195	0.1383	0.0100	0.0996	0.0144	0.1192
MASSACHUSETTS	0.0390	0.1937	0.0758	0.2647	0.0780	0.2682
MICHIGAN	0.0124	0.1108	0.0207	0.1423	0.0444	0.2060
MINNESOTA	0.0053	0.0728	0.0144	0.1192	0.0270	0.1621
MISSISSIPPI	0.0098	0.0983	0.0056	0.0749	0.0000	0.0000
MISSOURI	0.0124	0.1108	0.0069	0.0827	0.0678	0.2515
MONTANA	0.0018	0.0421	0.0044	0.0661	0.0000	0.0000
NEBRASKA	0.0000	0.0000	0.0219	0.1465	0.0228	0.1493
NEVADA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NEW HAMPSHIRE	0.0230	0.1501	0.0125	0.1112	0.0048	0.0691
NEW JERSEY	0.0559	0.2297	0.0764	0.2657	0.0276	0.1639
NEW MEXICO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NEW YORK	0.1339	0.3407	0.0877	0.2829	0.0954	0.2938
NORTH CAROLINA	0.0443	0.2059	0.0125	0.1112	0.0168	0.1285
NORTH DAKOTA	0.0009	0.0298	0.0125	0.1112	0.0066	0.0810
OHIO	0.0363	0.1872	0.0745	0.2627	0.1218	0.3271
OKLAHOMA	0.0000	0.0000	0.0019	0.0433	0.0078	0.0880
OREGON	0.0000	0.0000	0.0000	0.0000	0.0090	0.0945
PENNSYLVANIA	0.2296	0.4208	0.1472	0.3544	0.1098	0.3127
RHODE ISLAND	0.0000	0.0000	0.0138	0.1166	0.0018	0.0424
SOUTH CAROLINA	0.0098	0.0983	0.0000	0.0000	0.0018	0.0424
SOUTH DAKOTA	0.0071	0.0840	0.0069	0.0827	0.0066	0.0810
TENNESSEE	0.0000	0.0000	0.0213	0.1444	0.0258	0.1586
TEXAS	0.0248	0.1557	0.0038	0.0612	0.0198	0.1393
UTAH	0.0000	0.0000	0.0013	0.0354	0.0000	0.0000
VERMONT	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
VIRGINIA	0.0878	0.2831	0.0401	0.1962	0.0066	0.0810
WASHINGTON	0.0000	0.0000	0.0044	0.0661	0.0042	0.0647
WEST VIRGINIA	0.0027	0.0515	0.0100	0.0996	0.0066	0.0810
WISCONSIN	0.0098	0.0983	0.0307	0.1725	0.0264	0.1604
WYOMING	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table A-2

MEANS ($\bar{X}$) AND STANDARD DEVIATIONS (s) FOR VARIABLES USED IN REGRESSION MODELS FOR ASSOCIATE PROGRAMS

EXPLANATORY VARIABLES	SMALL PROGRAMS		MEDIUM PROGRAMS		LARGE PROGRAMS	
	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
NUMBER OF GRADUATIONS	27.3909	10.7564	44.4923	16.1538	80.8391	46.4961
NUMBER OF ADMISSIONS	41.7811	13.0037	68.9737	19.8515	127.0253	69.9629
NUMBER OF ATTRITIONS	12.0549	11.2419	19.2327	18.3179	34.7402	53.8795
FINANCIAL SUPPORT: PUBLIC	0.9100	0.2863	0.9071	0.2905	0.8903	0.3126
CONTROL: HOSPITAL	0.0016	0.0399	0.0026	0.0506	0.0011	0.0335
CONTROL: UNIVERSITY	0.2046	0.4036	0.2462	0.4309	0.2267	0.4188
CONTROL: JUNIOR COLLEGE	0.7906	0.4070	0.7506	0.4328	0.7722	0.4195
HOSPITAL BEDS PER CAPITA	6.6104	1.2361	6.8132	1.2781	7.0957	1.4820
HOSPITAL DAYS PER CAPITA	1.8207	0.4107	1.9102	0.4433	2.0327	0.5181
SALARIES: PUBLIC SCHOOL TEACHERS	12.8199	3.0356	12.8211	3.1434	13.0478	3.1014
POPULATION	6.8883	6.2010	8.6951	6.8668	9.5938	6.2969
POPULATION DENSITY	1.3873	1.7030	1.8502	2.0616	2.8142	7.9428
PHYSICIANS PER CAPITA	1.2884	0.3056	1.3616	0.3492	1.4150	0.3707
NURSING HOME BEDS PER CAPITA	4.9280	2.0942	5.2993	1.8771	5.0358	1.8233
HIGH SCHOOL GRADUATES	0.9178	0.8108	1.1444	0.8858	1.2342	0.7867
RN'S PER CAPITA	4.0080	1.1203	4.0926	1.2556	4.1520	1.1351
LPN'S PER CAPITA	1.8778	0.5123	1.8812	0.5512	1.8245	0.5399
YEAR 1968	0.0191	0.1370	0.0256	0.1581	0.0371	0.1891
YEAR 1969	0.0247	0.1552	0.0314	0.1745	0.0394	0.1945
YEAR 1970	0.0374	0.1899	0.0487	0.2153	0.0517	0.2216
YEAR 1971	0.0486	0.2150	0.0692	0.2539	0.0799	0.2712
YEAR 1972	0.0645	0.2457	0.0750	0.2635	0.0832	0.2763
YEAR 1973	0.0756	0.2645	0.0846	0.2784	0.0911	0.2879
YEAR 1974	0.0884	0.2840	0.0936	0.2914	0.0956	0.2941
YEAR 1975	0.1011	0.3016	0.1026	0.3035	0.0956	0.2941
YEAR 1976	0.1146	0.3187	0.1122	0.3157	0.1018	0.3025
YEAR 1977	0.1338	0.3405	0.1141	0.3180	0.1069	0.3090
YEAR 1978	0.1481	0.3553	0.1205	0.3257	0.1097	0.3126
YEAR 1979	0.1441	0.3513	0.1224	0.3279	0.1080	0.3105
For Admission Equations:						
CAPITATION 1972-75	0.1433	0.3505	0.2218	0.4156	0.2413	0.4280
CAPITATION 1976-79	0.3121	0.4635	0.2821	0.4501	0.2773	0.4478
LOANS/SCHOLARSHIPS 1965-69	0.0072	0.0844	0.0173	0.1305	0.0382	0.1918
LOANS/SCHOLARSHIPS 1970-71	0.0438	0.2047	0.0769	0.2666	0.1001	0.3002
LOANS/SCHOLARSHIPS 1972-75	0.2197	0.4142	0.2481	0.4320	0.2801	0.4492
LOANS/SCHOLARSHIPS 1976-79	0.0375	0.4794	0.3135	0.4640	0.3133	0.4640
CONSTRUCTION 1965-79	0.0358	0.1859	0.0953	0.2940	0.1569	0.3638
For Attrition/Graduation Equations:						
CAPITATION 1972-75	0.3153	0.6179	0.4647	0.7323	0.4955	0.7556
CAPITATION 1976-79	0.5518	0.8291	0.5006	0.7937	0.4910	0.7876
LOANS/SCHOLARSHIPS 1965-69	0.0167	0.1613	0.0417	0.2611	0.0911	0.3805
LOANS/SCHOLARSHIPS 1970-71	0.1027	0.3678	0.1744	0.4836	0.2289	0.5388
LOANS/SCHOLARSHIPS 1972-75	0.4674	0.7483	0.5212	0.7712	0.5726	0.7978
LOANS/SCHOLARSHIPS 1976-79	0.6298	0.8759	0.5532	0.8368	0.5495	0.8334
CONSTRUCTION 1965-79	0.0677	0.3562	0.1859	0.5765	0.3026	0.7090

Table A-2

MEANS ($\bar{X}$) AND STANDARD DEVIATIONS (s) FOR VARIABLES USED IN REGRESSION MODELS FOR ASSOCIATE PROGRAMS (CONTINUED)

	SMALL PROGRAMS		MEDIUM PROGRAMS		LARGE PROGRAMS	
STATES	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
ALABAMA	0.0119	0.1087	0.0186	0.1351	0.0141	0.1178
ARIZONA	0.0406	0.1975	0.0064	0.0798	0.0152	0.1223
ARKANSAS	0.0056	0.0745	0.0205	0.1418	0.0141	0.1178
CALIFORNIA	0.1234	0.3290	0.1564	0.3634	0.0939	0.2918
COLORADO	0.0056	0.0745	0.0237	0.1522	0.0045	0.0669
CONNECTICUT	0.0000	0.0000	0.0109	0.1039	0.0112	0.1055
DELAWARE	0.0096	0.0973	0.0026	0.0506	0.0000	0.0000
DISTRICT OF COLUMBIA	0.0000	0.0000	0.0000	0.0000	0.0045	0.0669
FLORIDA	0.0414	0.1993	0.0212	0.1439	0.0461	0.2098
GEORGIA	0.0358	0.1859	0.0462	0.2099	0.0112	0.1055
IDAHO	0.0175	0.1312	0.0077	0.0874	0.0056	0.0748
ILLINOIS	0.0326	0.1778	0.0417	0.1999	0.0748	0.2631
INDIANA	0.0000	0.0000	0.0269	0.1619	0.0427	0.2023
IOWA	0.0406	0.1975	0.0167	0.1281	0.0000	0.0000
KANSAS	0.0334	0.1799	0.0090	0.0943	0.0000	0.0000
KENTUCKY	0.0311	0.1735	0.0269	0.1619	0.0281	0.1654
LOUISIANA	0.0056	0.0745	0.0000	0.0000	0.0141	0.1178
MAINE	0.0000	0.0000	0.0077	0.0874	0.0028	0.0530
MARYLAND	0.0143	0.1189	0.0147	0.1206	0.0337	0.1806
MASSACHUSETTS	0.0446	0.2065	0.0500	0.2180	0.0146	0.1201
MICHIGAN	0.0263	0.1600	0.0372	0.1893	0.0495	0.2170
MINNESOTA	0.0111	0.1050	0.0071	0.0837	0.0253	0.1571
MISSISSIPPI	0.0470	0.2117	0.0327	0.1779	0.0000	0.0000
MISSOURI	0.0390	0.1937	0.0109	0.1039	0.0242	0.1537
MONTANA	0.0056	0.0745	0.0071	0.0837	0.0000	0.0000
NEBRASKA	0.0000	0.0000	0.0000	0.0000	0.0056	0.0748
NEVADA	0.0024	0.0488	0.0000	0.0000	0.0034	0.0580
NEW HAMPSHIRE	0.0000	0.0000	0.0000	0.0000	0.0039	0.0626
NEW JERSEY	0.0088	0.0932	0.0205	0.1418	0.0422	0.2011
NEW MEXICO	0.0223	0.1477	0.0000	0.0000	0.0051	0.0710
NEW YORK	0.0088	0.0932	0.0660	0.2484	0.1445	0.3517
NORTH CAROLINA	0.1011	0.3016	0.0205	0.1418	0.0096	0.0973
NORTH DAKOTA	0.0064	0.0796	0.0000	0.0000	0.0045	0.0669
OHIO	0.0143	0.1189	0.0436	0.2042	0.0523	0.2227
OKLAHOMA	0.0207	0.1424	0.0147	0.1206	0.0079	0.0884
OREGON	0.0175	0.1312	0.0179	0.1328	0.0062	0.0784
PENNSYLVANIA	0.0191	0.1370	0.0179	0.1328	0.0366	0.1877
RHODE ISLAND	0.0000	0.0000	0.0000	0.0000	0.0090	0.0945
SOUTH CAROLINA	0.0231	0.1502	0.0122	0.1097	0.0129	0.1130
SOUTH DAKOTA	0.0032	0.0564	0.0058	0.0758	0.0051	0.0710
TENNESSEE	0.0040	0.0630	0.0365	0.1877	0.0242	0.1537
TEXAS	0.0191	0.1370	0.0372	0.1893	0.0467	0.2110
UTAH	0.0000	0.0000	0.0045	0.0669	0.0028	0.0530
VERMONT	0.0096	0.0973	0.0129	0.1125	0.0000	0.0000
VIRGINIA	0.0533	0.2248	0.0115	0.1068	0.0135	0.1154
WASHINGTON	0.0247	0.1552	0.0276	0.1638	0.0202	0.1409
WEST VIRGINIA	0.1197	0.1087	0.0327	0.1779	0.0067	0.0819
WISCONSIN	0.0008	0.0282	0.0154	0.1231	0.0067	0.0819
WYOMING	0.0064	0.0796	0.0000	0.0000	0.0000	0.0000

Table A-3

MEANS ($\bar{X}$) AND STANDARD DEVIATIONS (s) FOR VARIABLES USED IN REGRESSION MODELS FOR BACCALAUREATE PROGRAMS

EXPLANATORY VARIABLES	SMALL PROGRAMS		MEDIUM PROGRAMS		LARGE PROGRAMS	
	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
NUMBER OF GRADUATIONS	38.6638	19.1026	62.9807	35.2699	111.1792	72.6238
NUMBER OF ADMISSIONS	55.1717	21.5189	91.9843	36.6769	164.4427	95.1380
NUMBER OF ATTRITIONS	8.7425	24.6087	13.5761	42.3471	22.3490	94.6729
FINANCIAL SUPPORT: PUBLIC	0.3548	0.4788	0.5374	0.4989	0.6115	0.4877
CONTROL: HOSPITAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CONTROL: UNIVERSITY	0.9943	0.0755	0.9819	0.1335	0.9854	0.1199
CONTROL: JUNIOR COLLEGE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HOSPITAL BEDS PER CAPITA	7.4522	1.7153	7.1708	1.8064	7.3519	1.6370
HOSPITAL DAYS PER CAPITA	2.0766	0.5590	2.0230	0.5974	2.1085	0.5526
SALARIES: PUBLIC SCHOOL TEACHERS	12.5601	3.1622	12.7566	3.0610	12.7981	3.1224
POPULATION	7.3759	6.5218	8.1511	6.4678	8.0619	5.8158
POPULATION DENSITY	3.3635	14.5870	4.1221	16.4419	3.8182	12.6118
PHYSICIANS PER CAPITA	1.3414	0.4514	1.4019	0.4537	1.3871	0.4135
NURSING HOME BEDS PER CAPITA	5.7326	2.4164	5.2687	2.1595	5.2644	1.9029
HIGH SCHOOL GRADUATES	0.9688	0.8157	1.0702	0.8242	1.0548	0.7301
RN'S PER CAPITA	4.2137	1.2758	4.3154	1.2511	4.3369	1.3050
LPN'S PER CAPITA	1.9376	0.5937	1.8927	0.5328	1.9162	0.5195
YEAR 1969	0.0629	0.2430	0.0580	0.2338	0.0687	0.2532
YEAR 1970	0.0658	0.2481	0.0628	0.2428	0.0719	0.2584
YEAR 1971	0.0701	0.2555	0.0761	0.2653	0.0781	0.2685
YEAR 1972	0.0730	0.2603	0.0797	0.2710	0.0885	0.2842
YEAR 1973	0.0830	0.2760	0.0918	0.2889	0.0927	0.2902
YEAR 1974	0.0930	0.2906	0.0966	0.2956	0.0906	0.2872
YEAR 1975	0.0987	0.2985	0.0990	0.2989	0.0990	0.2988
YEAR 1976	0.1016	0.3023	0.1027	0.3037	0.0990	0.2988
YEAR 1977	0.1102	0.3133	0.1087	0.3114	0.1031	0.3043
YEAR 1978	0.1245	0.3303	0.1123	0.3159	0.1042	0.3056
YEAR 1979	0.1173	0.3220	0.1123	0.3159	0.1042	0.3056
For Admission Equations:						
CAPITATION 1972-75	0.2318	0.4223	0.2645	0.4413	0.2865	0.4523
CAPITATION 1976-79	0.3176	0.4659	0.3140	0.4644	0.2985	0.4533
LOANS/SCHOLARSHIPS 1965-69	0.0443	0.2060	0.0483	0.2145	0.0573	0.2325
LOANS/SCHOLARSHIPS 1970-71	0.1159	0.3203	0.1220	0.3275	0.1240	0.3297
LOANS/SCHOLARSHIPS 1972-75	0.2847	0.4516	0.2693	0.4439	0.2917	0.4548
LOANS/SCHOLARSHIPS 1976-79	0.3562	0.4792	0.3285	0.4700	0.3031	0.4598
CONSTRUCTION 1963-79	0.2074	0.4397	0.1957	0.4235	0.3490	0.5575
For Attrition/Graduation Equations:						
CAPITATION 1972-75	0.7768	1.0714	0.8337	1.0522	0.8719	1.0909
CAPITATION 1976-79	0.7439	1.1350	0.7114	1.1193	0.6635	1.0808
LOANS/SCHOLARSHIPS 1965-69	0.2561	0.7012	0.2862	0.7484	0.3365	0.8094
LOANS/SCHOLARSHIPS 1970-71	0.3834	0.7053	0.4203	0.7504	0.4156	0.7301
LOANS/SCHOLARSHIPS 1972-75	0.9227	1.1214	0.8563	1.0581	0.8833	1.1012
LOANS/SCHOLARSHIPS 1976-79	0.8125	1.1924	0.7476	1.1482	0.6885	1.1111
CONSTRUCTION 1965-79	0.5637	1.2358	0.5592	1.2255	0.9698	1.5767

Table A-3

MEANS ($\bar{X}$) AND STANDARD DEVIATIONS (s) FOR VARIABLES USED IN REGRESSION MODELS FOR BACCALAUREATE PROGRAMS (CONTINUED)

	SMALL PROGRAMS		MEDIUM PROGRAMS		LARGE PROGRAMS	
STATES	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
ALABAMA	0.0057	0.0755	0.0278	0.1644	0.0198	0.1394
ARIZONA	0.0000	0.0000	0.0000	0.0000	0.0208	0.1429
ARKANSAS	0.0172	0.1300	0.0000	0.0000	0.0094	0.0964
CALIFORNIA	0.0773	0.2672	0.0954	0.2940	0.0344	0.1823
COLORADO	0.0000	0.0000	0.0254	0.1573	0.0083	0.0910
CONNECTICUT	0.0100	0.0996	0.0181	0.1335	0.0229	0.1497
DELAWARE	0.0000	0.0000	0.0000	0.0000	0.0115	0.1065
DISTRICT OF COLUMBIA	0.0157	0.1245	0.0205	0.1419	0.0115	0.1065
FLORIDA	0.0157	0.1245	0.0580	0.2338	0.0000	0.0000
GEORGIA	0.0386	0.1928	0.0036	0.0601	0.0115	0.1065
IDAHO	0.0157	0.1245	0.0000	0.0000	0.0000	0.0000
ILLINOIS	0.0429	0.2028	0.0266	0.1609	0.0469	0.2115
INDIANA	0.0300	0.1708	0.0266	0.1609	0.0313	0.1741
IOWA	0.0415	0.1996	0.0000	0.0000	0.0115	0.1065
KANSAS	0.0529	0.2241	0.0085	0.0916	0.0000	0.0000
KENTUCKY	0.0129	0.1128	0.0217	0.1459	0.0115	0.1065
LOUISIANA	0.0129	0.1128	0.0302	0.1712	0.0323	0.1769
MAINE	0.0000	0.0000	0.0012	0.0348	0.0115	0.1065
MARYLAND	0.0258	0.1585	0.0024	0.0491	0.0052	0.0720
MASSACHUSETTS	0.0172	0.1300	0.0193	0.1377	0.0479	0.2137
MICHIGAN	0.0215	0.1450	0.0229	0.1498	0.0479	0.2137
MINNESOTA	0.0672	0.2506	0.0217	0.1459	0.0156	0.1241
MISSISSIPPI	0.0329	0.1785	0.0000	0.0000	0.0104	0.1016
MISSOURI	0.0329	0.1785	0.0000	0.0000	0.0313	0.1741
MONTANA	0.0029	0.0535	0.0000	0.0000	0.0104	0.1016
NEBRASKA	0.0143	0.1188	0.0181	0.1335	0.0000	0.0000
NEVADA	0.0114	0.1064	0.0000	0.0000	0.0000	0.0000
NEW HAMPSHIRE	0.0000	0.0000	0.0109	0.1038	0.1004	0.1016
NEW JERSEY	0.0100	0.0996	0.0036	0.0601	0.0469	0.2115
NEW MEXICO	0.0000	0.0000	0.0000	0.0000	0.0083	0.0910
NEW YORK	0.1016	0.3023	0.0894	0.2855	0.1281	0.3344
NORTH CAROLINA	0.0343	0.1822	0.0531	0.2244	0.0229	0.1497
NORTH DAKOTA	0.0401	0.1962	0.0109	0.1038	0.0000	0.0000
OHIO	0.0000	0.0000	0.0640	0.2449	0.0354	0.1849
OKLAHOMA	0.0286	0.1668	0.0181	0.1335	0.0000	0.0000
OREGON	0.0000	0.0000	0.0097	0.0979	0.0094	0.0964
PENNSTLVANIA	0.0529	0.2241	0.0531	0.2244	0.0625	0.2422
RHODE ISLAND	0.0000	0.0000	0.0109	0.1038	0.0167	0.1281
SOUTH CAROLINA	0.0000	0.0000	0.0121	0.1093	0.0187	0.1357
SOUTH DAKOTA	0.0143	0.1188	0.0133	0.1146	0.0115	0.1065
TENNESSEE	0.0215	0.1450	0.0024	0.0491	0.0281	0.1654
TEXAS	0.0300	0.1708	0.0266	0.1609	0.0542	0.2265
UTAH	0.0100	0.0996	0.0133	0.1146	0.0000	0.0000
VERMONT	0.0000	0.0000	0.0133	0.1146	0.0000	0.0000
VIRGINIA	0.0000	0.0000	0.0531	0.2244	0.0146	0.1199
WASHINGTON	0.0129	0.1128	0.0302	0.1712	0.0156	0.1241
WEST VIRGINIA	0.0286	0.1668	0.0133	0.1146	0.0000	0.0000
WISCONSIN	0.0000	0.0000	0.0374	0.1900	0.0531	0.2244
WYOMING	0.0000	0.0000	0.0133	0.1146	0.0000	0.0000

Table A-4

FREQUENCY OF YEAR-TO-YEAR DECREASES IN ADMISSIONS BY TYPE OF PROGRAM BY RECEIPT/NONRECEIPT OF FORMULA/CAPITATION GRANTS BY YEAR
(Number of Programs and Percentage of Programs*)

	DIPLOMA PROGRAMS				ASSOCIATE PROGRAMS				BACCALAUREATE PROGRAMS			
	Programs Not Receiving Formula/ Capitation Grants		Programs Receiving Formula/ Capitation Grants		Programs Not Receiving Formula/ Capitation Grants		Programs Receiving Formula/ Capitation Grants		Programs Not Receiving Formula/ Capitation Grants		Programs Receiving Formula/ Capitation Grants	
Year	Adm < 0	Adm ≥ 0	Adm < 0	Adm ≥ 0	Adm < 0	Adm ≥ 0	Adm < 0	Adm ≥ 0	Adm < 0	Adm ≥ 0	Adm < 0	Adm ≥ 0
1968	--	--	--	--	45 (35)	85 (65)	na	na	--	--	--	--
1969	100 (44)	129 (56)	121 (41)	177 (59)	49 (33)	101 (67)	na	na	62 (39)	96 (61)	na	na
1970	210 (41)	298 (59)	na	na	53 (25)	162 (75)	na	na	54 (32)	113 (68)	na	na
1971	107 (41)	380 (59)	na	na	64 (21)	247 (79)	na	na	40 (21)	147 (79)	na	na
1972	82 (41)	119 (59)	60 (24)	193 (76)	40 (27)	108 (73)	146 (23)	152 (77)	21 (48)	23 (52)	39 (25)	119 (75)
1973	126 (57)	94 (43)	104 (52)	95 (48)	61 (38)	100 (62)	71 (31)	157 (69)	31 (52)	29 (48)	57 (35)	106 (65)
1974	101 (47)	114 (53)	71 (43)	95 57)	59 (33)	121 (67)	92 (37)	155 (63)	21 (30)	48 (70)	57 (35)	106 (65)
1975	82 (41)	119 (59)	63 (40)	94 (60)	65 (37)	110 (63)	100 (35)	182 (65)	28 (38)	46 (62)	78 (45)	94 (55)
1976	95 (53)	83 (47)	48 (30)	111 (70)	78 (41)	114 (59)	101 (33)	207 (67)	35 (48)	38 (52)	66 (37)	112 (63)
1977	101 (61)	64 (39)	72 (45)	89 (55)	98 (48)	106 (52)	135 (41)	197 (59)	27 (37)	46 (63)	69 (36)	124 (64)
1978	92 (61)	58 (39)	79 (51)	77 (49)	111 (52)	104 (48)	150 (42)	204 (58)	41 (55)	33 (45)	113 (55)	93 (45)
1979	138 (78)	40 (22)	63 (57)	48 (43)	138 (59)	95 (41)	198 (60)	133 (40)	58 (62)	35 (38)	107 (59)	75 (41)

*Numbers in parentheses indicate percentage distribution of schools between each pair of columns.

na: Not applicable, no formula/capitation grants available.

Table A-5

REGRESSION RESULTS: NUMBER OF NURSING SCHOOL ADMISSIONS, BY TYPE AND SIZE OF PROGRAM
Test for Differential Effectiveness of NTA Funding Across Areas with Different RN/Population Ratios

	DIPLOMA PROGRAMS			ASSOCIATE PROGRAMS			BACCALAUREATE PROGRAMS		
EXPLANATORY VARIABLES	Small	Medium	Large	Small	Medium	Large	Small	Medium	Large
HOSPITAL BEDS PER CAPITA	-1.94	5.59	-16.67	3.19	-6.30	27.70	0.67	5.55	-18.96
	(-1.00)	(2.61)	(-4.21)	(1.27)	(-1.62)	(3.04)	(0.12)	(0.63)	(-1.17)
HOSPITAL DAYS PER CAPITA	5.46	-13.66	47.23	-4.47	7.47	-88.06	-29.56	-19.41	51.10
	(0.93)	(-2.10)	(3.65)	(-0.58)	(0.60)	(-2.99)	(-1.64)	(-0.71)	(0.98)
SALARIES: PUBLIC SCHOOL TEACHERS	-0.11	-0.76	-2.09	-2.05	-3.36	-5.41	1.89	-1.44	-10.83
	(-0.18)	(-1.33)	(-1.76)	(-4.03)	(-3.77)	(-2.64)	(1.10)	(-0.62)	(-3.05)
POPULATION	6.26	1.18	6.31	-2.83	-6.41	-0.79	-6.57	-13.37	-23.01
	(2.61)	(0.60)	(1.91)	(-2.33)	(-3.52)	(-0.19)	(-2.00)	(-2.71)	(-2.36)
POPULATION DENSITY	-12.64	-3.34	3.81	9.25	40.56	-4.50	0.78	-1.04	-6.03
	(-2.71)	(-0.47)	(3.49)	(0.94)	(2.27)	(-1.36)	(0.63)	(-0.52)	(-1.66)
PHYSICIANS PER CAPITA	-12.86	5.10	4.07	-20.49	-8.36	29.04	-8.66	-13.19	-164.30
	(-1.39)	(0.58)	(0.28)	(-2.06)	(-0.48)	(1.03)	(-0.46)	(-0.41)	(-3.23)
NURSING HOME BEDS PER CAPITA	0.99	-0.21	-1.26	0.05	-2.33	1.45	0.17	3.97	-0.43
	(1.65)	(-0.59)	(-1.96)	(0.09)	(-2.98)	(0.75)	(0.17)	(2.37)	(-0.14)
HIGH SCHOOL GRADUATES	-11.36	2.07	-14.60	-1.54	3.14	-37.14	13.40	-6.99	-15.57
	(-2.48)	(0.51)	(-2.42)	(-0.46)	(0.76)	(-3.83)	(2.19)	(-0.60)	(-0.84)
RN'S PER CAPITA	0.66	-1.84	-2.20	1.65	-4.36	-4.34	-6.28	5.85	2.38
	(0.47)	(-1.47)	(-0.88)	(1.23)	(-1.88)	(-0.79)	(-1.56)	(1.19)	(0.30)
LPN'S PER CAPITA	1.18	0.63	5.40	-3.32	1.94	-13.94	6.74	-14.61	-23.92
	(0.76)	(0.45)	(1.19)	(-1.63)	(0.60)	(-1.71)	(1.51)	(-2.01)	(-2.06)
YEAR 1969	—	—	—	4.90	8.16	6.62	—	—	—
				(2.19)	(2.50)	(0.93)			
YEAR 1970	0.84	3.38	-1.16	10.49	10.34	24.04	4.12	4.70	22.73
	(0.71)	(2.23)	(-0.36)	(4.41)	(2.67)	(2.48)	(0.70)	(0.38)	(1.20)
YEAR 1971	6.38	1.00	7.78	17.89	21.13	50.06	12.99	22.35	65.14
	(3.94)	(5.43)	(2.09)	(6.80)	(4.76)	(4.50)	(2.04)	(1.76)	(3.28)
YEAR 1972	7.65	13.59	12.58	24.90	28.89	68.67	9.78	28.73	115.82
	(3.50)	(5.97)	(2.89)	(8.61)	(5.67)	(5.61)	(1.50)	(2.31)	(5.48)
YEAR 1973	6.98	12.31	11.69	28.13	35.10	74.92	9.68	30.70	130.46
	(2.67)	(4.64)	(2.34)	(8.68)	(6.12)	(5.59)	(1.37)	(2.31)	(5.76)
YEAR 1974	7.56	13.56	12.58	31.47	37.63	82.97	11.74	42.49	151.56
	(2.29)	(4.32)	(2.17)	(8.64)	(5.75)	(5.49)	(1.44)	(2.84)	(6.05)
YEAR 1975	8.84	15.23	15.64	35.52	43.38	87.45	8.96	43.99	167.19
	(2.22)	(4.11)	(2.30)	(8.57)	(5.78)	(5.10)	(0.96)	(2.57)	(5.99)
YEAR 1976	8.24	14.49	11.50	38.62	46.88	76.86	9.22	52.99	180.37
	(1.77)	(3.39)	(1.43)	(8.13)	(5.42)	(3.97)	(0.86)	(2.75)	(5.85)
YEAR 1977	7.61	12.20	9.33	41.56	51.22	80.39	8.65	56.63	202.85
	(1.40)	(2.48)	(1.00)	(7.78)	(5.22)	(3.71)	(0.70)	(2.59)	(5.86)
YEAR 1978	6.62	11.43	7.04	43.09	53.69	80.76	3.00	54.30	212.51
	(1.06)	(2.03)	(0.66)	(7.58)	(4.88)	(3.34)	(0.21)	(2.19)	(5.47)
YEAR 1979	4.76	9.29	4.66	47.37	48.47	65.66	-5.88	47.58	208.00
	(0.68)	(1.47)	(0.39)	(7.18)	(3.95)	(2.47)	(-0.37)	(1.72)	(4.86)
FORMULA GRANTS 1965-69	-0.03	6.04	8.49	—	—	—	—	—	—
	(-0.01)	(2.66)	(1.78)						
CAPITATION 1972-75	3.09	4.68	7.47	-0.72	4.40	-3.92	10.10	10.14	7.18
	(3.12)	(4.54)	(3.66)	(-0.39)	(1.58)	(-0.53)	(2.81)	(1.15)	(0.43)
CAPITATION 1976-79	4.66	5.72	15.19	6.42	1.16	14.44	16.09	31.93	-5.29
	(3.50)	(5.06)	(6.88)	(3.73)	(0.35)	(1.85)	(4.00)	(2.48)	(-0.33)
LOANS/SCHOLARSHIPS 1965-69	4.78	-0.40	-7.04	8.89	-2.37	-22.99	12.55	12.41	22.73
	(2.25)	(-0.17)	(-1.43)	(1.84)	(-0.47)	(-2.50)	(1.95)	(0.98)	(1.13)
LOANS/SCHOLARSHIPS 1970-71	3.61	1.80	-0.09	3.25	-0.69	-9.51	-1.19	16.41	28.37
	(2.77)	(1.34)	(-0.03)	(1.23)	(-0.19)	(-1.21)	(-0.22)	(1.59)	(1.84)
LOANS/SCHOLARSHIPS 1972-75	-0.18	0.85	0.26	3.90	-3.54	-4.69	-8.29	5.44	-8.99
	(-0.15)	(0.69)	(0.09)	(1.89)	(-1.18)	(-0.59)	(-1.68)	(0.60)	(-0.50)
LOANS/SCHOLARSHIPS 1976-79	-0.89	2.16	1.74	1.28	4.17	12.20	-17.48	-18.49	8.49
	(-0.62)	(1.53)	(0.56)	(0.61)	(1.13)	(1.34)	(-3.18)	(-1.35)	(0.46)
CONSTRUCTION 1965-79	-1.57	9.31	-20.36	-1.56	22.91	83.47	-0.67	-11.30	-2.66
	(-0.39)	(0.99)	(-1.40)	(-0.45)	(3.76)	(4.36)	(-0.12)	(-0.70)	(-0.19)
D1 x FORMULA GRANTS 1965-69	0.11	-1.93	-14.78	—	—	—	—	—	—
	(0.03)	(-0.47)	(-2.10)						
D1 x CAPITATION 1972-75	2.40	-1.58	3.17	2.87	-0.39	3.26	-12.20	9.44	-34.32
	(1.13)	(-0.85)	(1.02)	(1.34)	(-0.12)	(0.37)	(-2.39)	(0.67)	(-1.31)
D1 x CAPITATION 1976-79	1.53	5.30	-2.37	-0.17	4.64	-0.57	4.93	-27.04	53.37
	(0.66)	(2.54)	(-0.70)	(-0.08)	(1.14)	(-0.06)	(0.83)	(-1.66)	(1.82)
D1 x LOANS/SCHOLARSHIPS 1965-69	-2.22	5.31	18.07	-5.76	-10.65	37.58	-13.12	-4.25	18.51
	(-0.62)	(1.24)	(2.45)	(-0.92)	(-1.65)	(3.32)	(-1.83)	(-0.37)	(0.95)
D1 x LOANS/SCHOLARSHIPS 1970-71	-0.77	-0.72	2.30	-4.22	-5.00	9.10	-5.09	-7.39	-5.41
	(-0.36)	(-0.32)	(0.65)	(-1.47)	(-1.36)	(1.15)	(-0.86)	(-0.81)	(-0.33)
D1 x LOANS/SCHOLARSHIPS 1972-75	-2.14	1.54	-3.74	-5.66	4.06	-6.78	12.44	-13.11	47.65
	(-1.06)	(0.69)	(-0.95)	(-2.44)	(1.16)	(-0.74)	(1.96)	(-0.93)	(1.76)
D1 x LOANS/SCHOLARSHIPS 1976-79	-1.60	-2.47	-0.99	-6.07	-4.56	-12.61	0.83	20.53	-49.16
	(-0.69)	(-1.06)	(-0.24)	(-2.59)	(-1.03)	(-1.15)	(0.11)	(1.22)	(-1.36)
D1 x CONSTRUCTION 1965-79	—	—	39.80	—	—	-78.20	6.65	18.07	9.75
			(2.08)			(-3.30)	(0.76)	(0.93)	(0.34)

D1 = 1 for all programs located in states ranked in bottom half of national distribution of RN/population ratios in 1972;
= 0 for all other programs.

Table A-6

PERCENTAGE OF SCHOOLS RECEIVING NTA FUNDING BY STATE, 1968/69* TO 1979
(Percentage of School Years in Which Funding Was Received)

STATE/AREA**	Percentage of Programs Receiving Loan/ Scholarship Funds	Percentage of Programs Receiving Formula/ Capitation Grants	Number of Programs in Data Set
Arkansas	62	51	85
Alabama	73	58	186
Mississippi	50	48	163
Tennessee	58	38	226
Texas	80	61	327
Louisiana	62	52	138
Oklahoma	87	82	114
Kentucky	62	36	201
New Mexico	89	82	45
Georgia	31	24	241
Utah	75	47	32
South Carolina	42	35	113
Indiana	64	42	272
Missouri	73	57	300
North Carolina	55	38	364
Nevada	35	6	17
Idaho	75	47	55
Michigan	81	50	380
West Virginia	88	65	139
California	69	44	793
Virginia	48	30	341
Florida	62	56	242
Maryland	86	42	188
Ohio	79	47	629
Arizona	72	40	109
Illinois	68	48	688
Kansas	90	61	180
Oregon	74	53	93
Iowa	83	58	238
Wisconsin	83	62	223
Washington	88	71	173
New Jersey	56	42	404
Wyoming	100	84	19
Nebraska	95	46	108
South Dakota	92	70	84
North Dakota	81	59	85
Montana	73	69	39
Maine	78	52	67
Minnesota	70	39	224
Rhode Island	76	44	66
New York	61	42	1089
Colorado	84	58	107
Pennsylvania	66	43	935
Delaware	52	43	56
New Hampshire	71	43	80
Connecticut	62	53	182
Vermont	72	44	43
Massachusetts	59	32	529
District of Columbia	97	59	61
ALL STATES/AREAS	68	47	11473

* 1968-79 for associate programs; 1969-79 for other programs.

**States/areas appear in the order of their RN/population ratios in 1972, Arkansas having the lowest ratio and the District of Columbia having the highest ratio

Table A-7

REGRESSION RESULTS: RECEIPT/NONRECEIPT OF LOAN/SCHOLARSHIP FUNDS AND RECEIPT/NONRECEIPT OF FORMULA/CAPITATION GRANTS BY TYPE OF PROGRAM*
(Ordinary Least Squares Estimates for Dichotomous Dependent Variables)

	FUNDS FOR LOANS/SCHOLARSHIPS			FORMULA/CAPITATION GRANTS		
EXPLANATORY VARIABLES	Diploma	Associate	Baccalaureate	Diploma	Associate	Baccalaureate
INTERCEPT	0.50	0.65	1.14	0.12	0.76	0.94
FINANCIAL SUPPORT: PUBLIC	-0.12 (65.83)	-0.21 (121.07)	-0.23 (296.24)	-0.10 (42.47)	-0.15 (34.55)	-0.21 (147.30)
CONTROL: HOSPITAL	-0.05 (3.66)	-0.57 (46.64)	—	—	-0.19 (4.15)	—
CONTROL: JUNIOR COLLEGE	—	—	—	—	0.08 (17.78)	—
HOSPITAL BEDS PER CAPITA	—	0.05 (61.71)	—	—	—	—
HOSPITAL DAYS PER CAPITA	-0.05 (16.38)	—	—	—	—	—
SALARIES: PUBLIC SCHOOL TEACHERS	—	—	—	—	0.01 (17.24)	—
POPULATION	—	0.00** (6.81)	-0.02 (141.18)	—	—	—
PHYSICIANS PER CAPITA	—	—	-0.06 (10.74)	0.07 (4.06)	—	-0.10 (18.64)
NURSING HOME BEDS PER CAPITA	—	0.01 (6.65)	—	-0.01 (3.53)	—	—
HIGH SCHOOL GRADUATES	-0.05 (13.99)	—	—	—	-0.11 (39.36)	-0.15 (92.18)
RN'S PER CAPITA	0.04 (34.32)	-0.07 (56.16)	—	-0.04 (13.22)	—	—
LPN'S PER CAPITA	—	-0.20 (101.77)	—	—	-0.06 (12.05)	-0.04 (4.01)
YEAR 1966	-0.13 (42.27)	-0.08 (4.34)	-0.05 (3.51)	—	—	—
YEAR 1967	-0.05 (7.64)	—	—	0.10 (22.27)	—	—
YEAR 1968	—	—	0.06 (5.05)	0.15 (54.40)	—	—
YEAR 1969	—	0.10 (10.89)	0.05 (3.77)	0.21 (111.82)	—	—
YEAR 1970	—	0.33 (129.64)	0.12 (22.28)	—	—	—
YEAR 1971	-0.07 (14.19)	0.43 (224.03)	0.10 (16.43)	—	—	—
YEAR 1972	—	0.53 (338.36)	0.13 (29.15)	0.07 (12.48)	—	0.04 (2.83)
YEAR 1973	0.04 (3.27)	0.49 (272.78)	0.04 (2.14)	—	—	—
YEAR 1974	-0.16 (50.62)	0.42 (181.75)	-0.06 (6.18)	—	—	—
YEAR 1975	-0.11 (21.71)	0.55 (289.43)	—	—	—	—
YEAR 1976	—	0.60 (310.67)	—	—	—	—
YEAR 1977	—	0.63 (300.82)	—	0.05 (3.59)	—	—
YEAR 1978	—	0.66 (296.73)	—	0.09 (10.46)	—	0.05 (3.92)
YEAR 1979	—	0.70 (295.80)	—	—	—	—
ENROLLMENT < 25	-0.10 (8.39)	-0.49 (170.53)	-0.61 (134.63)	—	-0.49 (71.30)	—
25 < ENROLLMENT < 50	—	-0.36 (379.79)	-0.54 (266.94)	0.07 (3.54)	-0.22 (70.27)	—
50 < ENROLLMENT < 100	0.10 (21.10)	-0.13 (108.07)	-0.22 (103.92)	0.24 (46.58)	-0.11 (45.77)	0.21 (15.79)
100 < ENROLLMENT < 200	0.28 (181.50)	—	—	0.47 (182.15)	—	0.29 (37.51)
ENROLLMENT > 200	0.30 (150.62)	—	—	0.59 (249.71)	0.05 (7.82)	0.42 (81.79)
R^2	0.22	0.25	0.28	0.20	0.15	0.25

* Coefficients may be interpreted as changes in proportion of programs receiving financial assistance; partial F-statistics given in parentheses; stepwise selection of explanatory variables causes not all variables to enter all equations.
**Less than 0.005.

Table A-7

REGRESSION RESULTS: RECEIPT/NONRECEIPT OF LOAN/SCHOLARSHIP FUNDS AND RECEIPT/NONRECEIPT OF FORMULA/CAPITATION GRANTS BY TYPE OF PROGRAM* (CONTINUED)
Ordinary Least Squares Estimates for Dichotomous Dependent Variables)

STATES	FUNDS FOR LOANS/SCHOLARSHIPS			FORMULA/CAPITATION GRANTS		
	Diploma	Associate	Baccalaureate	Diploma	Associate	Baccalaureate
ALABAMA	0.16 (13.43)	—	-0.19 (17.50)	0.12 (6.53)	—	-0.18 (10.68)
ARIZONA	-0.30 (5.14)	0.12 (8.40)	-0.38 (44.59)	—	-0.24 (24.16)	-0.24 (11.66)
ARKANSAS	—	—	—	—	—	—
CALIFORNIA	[illegible] (33.28)	—	—	0.14 (9.32)	0.13 (12.20)	-0.12 (7.06)
COLORADO	0.27 (18.03)	—	—	0.31 (19.24)	—	—
CONNECTICUT	-0.15 (16.50)	—	-0.27 (31.05)	—	-0.16 (5.65)	-0.17 (7.58)
DELAWARE	-0.32 (22.70)	—	—	—	-0.18 (2.38)	—
DISTRICT OF COLUMBIA	0.14 (12.93)	—	—	—	—	—
FLORIDA	—	—	-0.26 (37.04)	0.41 (21.24)	0.14 (14.12)	-0.37 (41.72)
GEORGIA	-0.32 (31.30)	-0.38 (131.92)	-0.46 (90.34)	-0.24 (24.56)	-0.30 (37.20)	-0.36 (85.25)
IDAHO	—	0.27 (19.03)	—	—	—	—
ILLINOIS	-0.04 (4.14)	-0.10 (15.41)	0.07 (4.88)	—	—	—
INDIANA	—	-0.18 (24.83)	-0.26 (42.12)	—	-0.13 (6.93)	-0.30 (31.95)
IOWA	0.22 (7.56)	0.10 (4.95)	—	0.36 (68.00)	—	—
KANSAS	0.36 (88.85)	—	—	0.36 (56.60)	—	—
KENTUCKY	0.08 (2.22)	-0.13 (14.02)	-0.31 (39.76)	-0.13 (5.01)	-0.12 (7.99)	-0.37 (74.21)
LOUISIANA	-0.15 (7.30)	-0.32 (26.97)	-0.09 (5.05)	—	-0.12 (2.66)	-0.10 (2.83)
MAINE	0.11 (3.31)	—	-0.41 (21.82)	0.25 (14.92)	—	-0.30 (7.48)
MARYLAND	—	—	—	-0.17 (13.76)	—	—
MASSACHUSETTS	—	-0.19 (22.99)	-0.24 (43.92)	0.12 (16.85)	-0.40 (99.81)	-0.34 (50.50)
MICHIGAN	—	0.15 (26.89)	0.12 (11.82)	-0.08 (4.42)	—	0.17 (12.93)
MINNESOTA	0.13 (11.53)	-0.32 (40.36)	—	0.07 (2.21)	-0.46 (67.41)	—
MISSISSIPPI	—	-0.19 (22.87)	-0.13 (5.30)	—	—	-0.11 (2.68)
MISSOURI	—	—	-0.08 (3.65)	0.07 (3.76)	0.14 (9.11)	-0.11 (3.88)
MONTANA	0.33 (12.70)	—	-0.14 (2.37)	0.38 (13.86)	0.35 (8.00)	—
NEBRASKA	0.24 (30.09)	—	-0.12 (4.29)	0.26 (24.33)	—	-0.34 (44.63)
NEVADA	—	-0.16 (2.77)	-0.34 (33.57)	—	-0.40 (10.69)	-0.41 (45.41)
NEW HAMPSHIRE	—	0.36 (6.20)	—	—	—	—
NEW JERSEY	-0.26 (99.04)	0.08 (4.99)	-0.15 (9.53)	-0.06 (4.09)	—	-0.29 (23.40)
NEW MEXICO	0.70 (4.99)	—	—	0.88 (7.65)	—	—
NEW YORK	—	—	—	—	—	—
NORTH CAROLINA	-0.34 (92.77)	—	-0.37 (16.26)	-0.23 (34.19)	—	-0.42 (81.34)
NORTH DAKOTA	-0.11 (3.01)	0.23 (6.46)	—	—	0.34 (8.59)	—
OHIO	0.20 (50.89)	—	—	0.12 (22.81)	—	—
OKLAHOMA	0.15 (5.41)	—	—	0.17 (5.07)	0.40 (55.65)	—
OREGON	0.25 (8.23)	—	—	—	—	-0.18 (2.96)
PENNSYLVANIA	—	0.11 (10.00)	—	0.06 (6.16)	0.09 (4.95)	0.09 (6.43)
RHODE ISLAND	—	-0.15 (2.59)	—	0.17 (4.98)	-0.48 (17.18)	—
SOUTH CAROLINA	-0.20 (5.99)	-0.14 (9.16)	-0.76 (140.07)	—	—	-0.76 (81.24)
SOUTH DAKOTA	0.30 (20.63)	-0.23 (8.85)	—	0.43 (34.51)	0.50 (4.29)	—
TENNESSEE	—	-0.17 (19.96)	-0.47 (99.91)	—	-0.23 (23.66)	-0.55 (78.35)
TEXAS	—	0.16 (22.31)	—	—	0.28 (45.42)	—
UTAH	0.54 (19.07)	-0.34 (17.14)	-0.40 (39.92)	—	-0.50 (20.18)	-0.43 (25.85)
VERMONT	0.38 (7.20)	0.34 (30.73)	-0.06 (39.32)	0.31 (10.41)	0.13 (3.46)	-0.36 (34.83)
VIRGINIA	-0.12 (15.03)	-0.30 (68.27)	-0.11 (5.98)	-0.15 (19.40)	-0.29 (45.53)	—
WASHINGTON	0.23 (3.29)	0.29 (49.66)	-0.22 (21.26)	0.26 (12.65)	0.17 (14.22)	-0.31 (25.45)
WEST VIRGINIA	—	—	-0.14 (5.74)	—	0.16 (8.31)	-0.14 (3.31)
WISCONSIN	0.13 (11.23)	0.18 (7.32)	-0.13 (18.35)	0.29 (42.08)	0.26 (17.06)	-0.25 (21.57)
WYOMING	—	—	—	—	0.22 (2.40)	—

*Excluded as explicit variable: all coefficients are relative to New York.